

作成承認印

配布許可印



AF-S VR Zoom-Nikkor

ED 200-400mm f/4G IF

JAA78751

REPAIR MANUAL

Nikon | NIKON CORPORATION
Tokyo, Japan

Copyright © 2003 by Nikon Corporation.
All Rights Reserved.

SPECIFICATIONS

Type of lens	G-type AF Zoom- Nikkor lens having built-in CPU and Nikon bayonet mount
Focal length	200mm-400mm
Maximum aperture	f/4
Lens construction	24 elements in 17 groups (One protective glass is built in) (4 ED lens elements)
Picture angle	6°10'-12°20' (5°-9°50' with IX 240 system cameras, 4°-8° with Nikon Digital Camera D1/D1H/D1X/D100)
Focal length scale	200,250,300,350,400mm
Distance information	Output to camera body
Zoom control	Manually via separate zoom ring
Focusing	Nikon Internal Focusing (IF) system (utilizing an internal Silent Wave Motor); manually via separate focus ring
Shooting distance scale	Graduated in meters and feet from 2m (6.5ft.) to infinity (∞)
Closest focus distance	2.0m (6.5ft.) AF, 1.95m (6.4ft) MF
Diaphragm	Fully automatic
Aperture range	f/4 to f36
Exposure measurement	Via full-aperture method with cameras having CPU interface system
Tripod socket	Rotary type
Attachment size	Rear setting type 52mm (P = 0.75mm)
Dimensions	Approx. 124mm dia. ×365mm extension from the camera's lens mount flange (with protective glass)
Weight	Approx.3,275g (with protective glass)

※ Before Disassembly / (Re)assembly / Adjustment

On this lens, the VR (vibration-reduction) unit is mounted to correct the picture blur.

In order to maintain the functional accuracy of the picture blur correction, if detaching the VR (vibration-reduction) unit and gyro base plate, be sure to adjust the VR by using the VR lens adjustment equipment (J15380) .

However, if disassembling the parts except the above, the VR adjustment is NOT necessary.

At service agencies where the "VR lens adjustment equipment" is not prepared, do NEITHER disassemble NOR repair the products of the above case.

Disassembly

Protective glass, Filter holder

Protective glass



- Remove the protective glass.
- Remove the filter holder.

Filter holder



1st lens group, Rubber ring

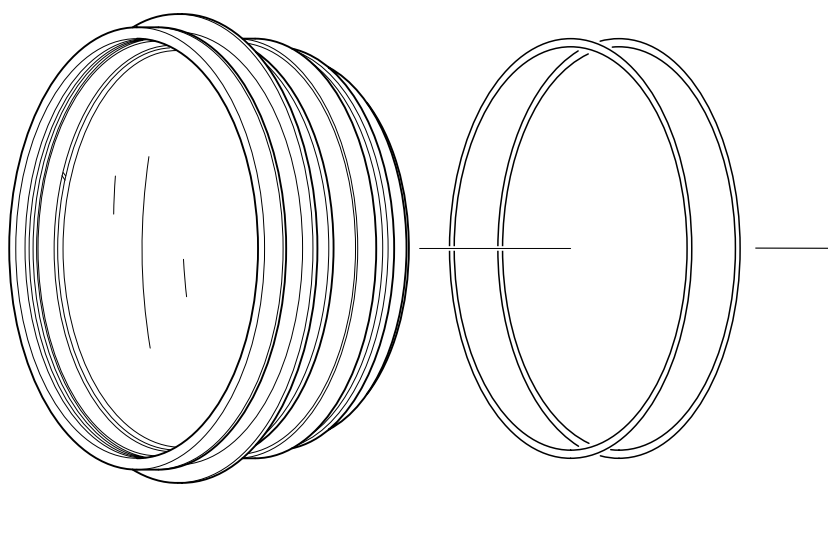


- Fold the rubber ring and take out 3 screws (#277).
- Remove the 1st lens group.
- Remove the rubber ring.

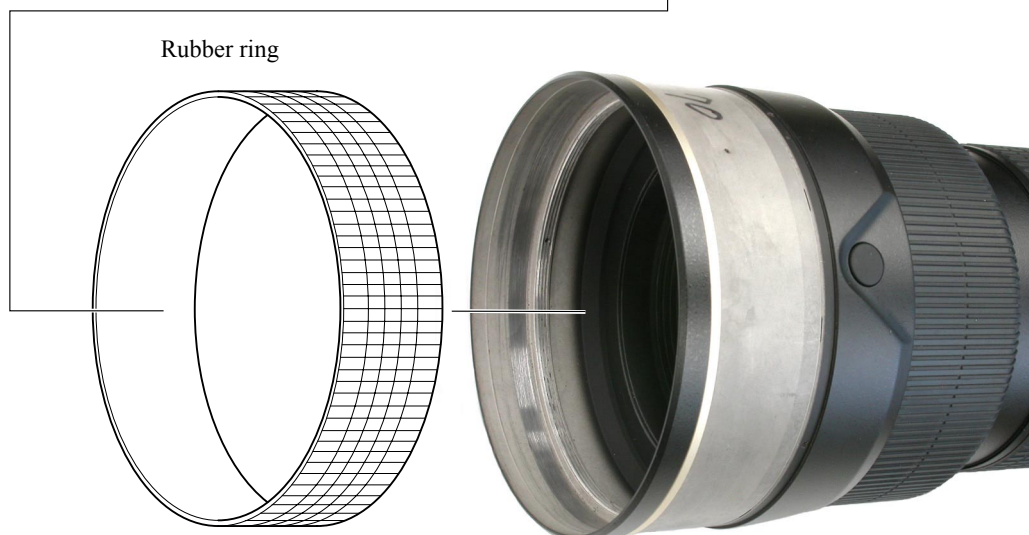


1st lens group

#342



Rubber ring



2nd, 3rd, 4th lens group

2nd lens group

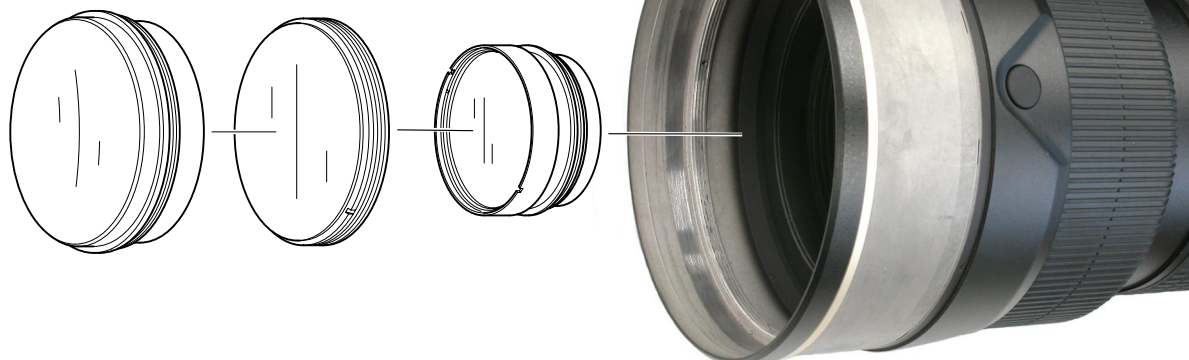
(Use the tool J11297
for disassembly)

3rd lens group

(Use J11298)

4th lens group

(Use J11299)

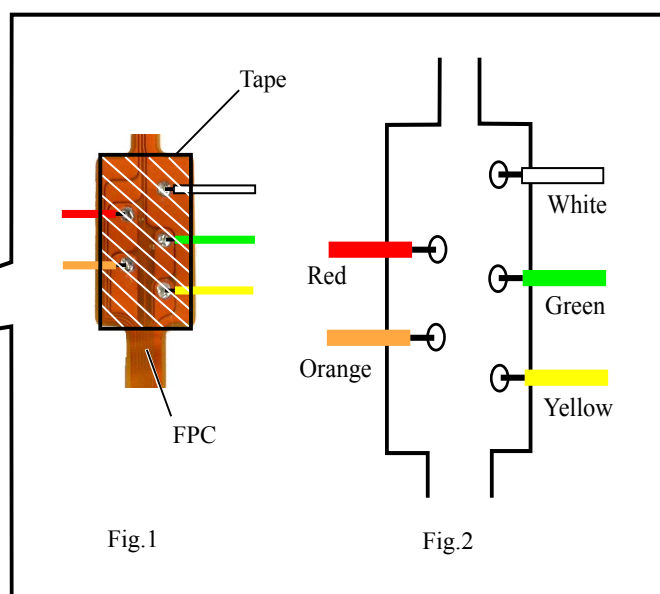


Preset Switch unit



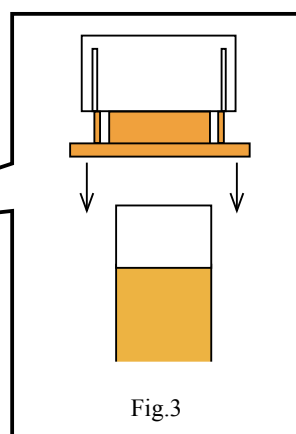
#323×2

Preset switch unit

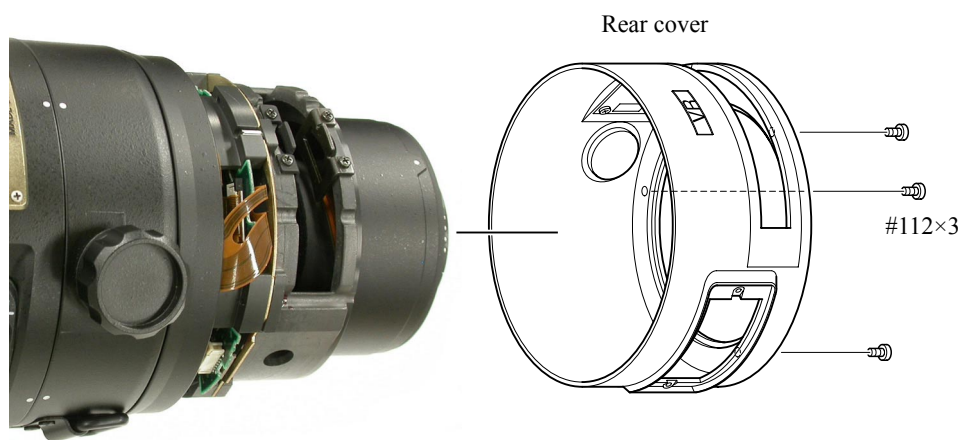


- Remove the tape that was put on FPC. (ref. Fig. 1)
- Unsolder the 5 wires of the preset switch unit. (ref. Fig.2)

Rear cover

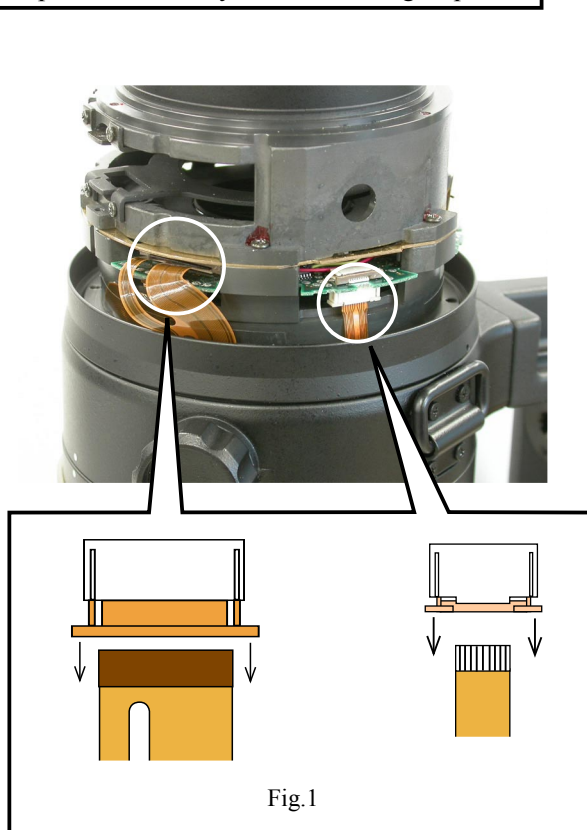


- Detach the connector. (ref. Fig.3)

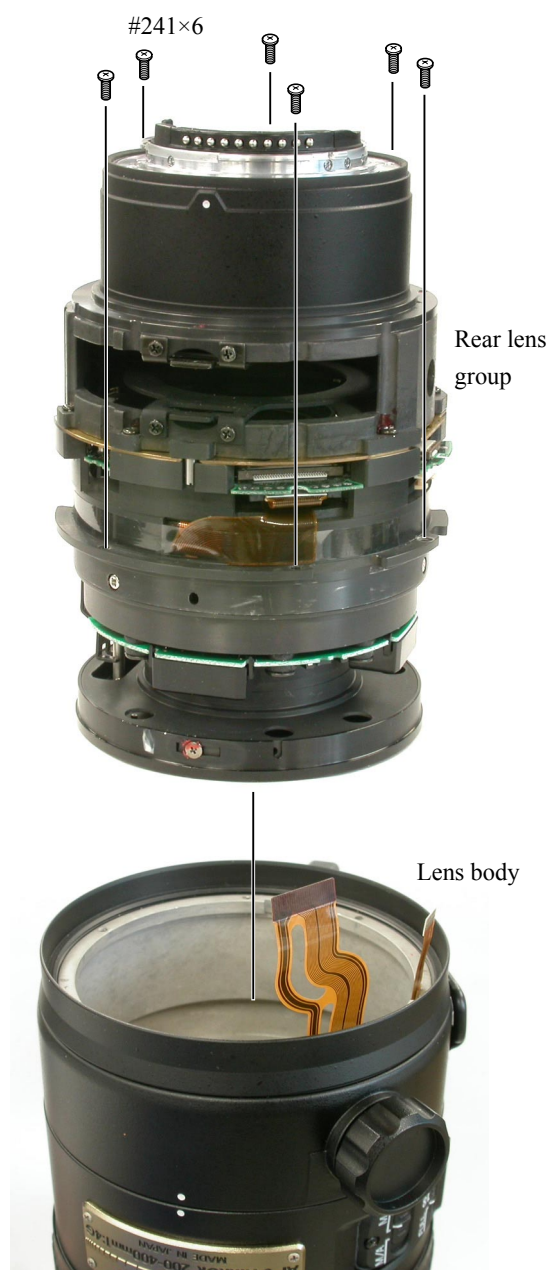


- Take out 3 screws (#112).
- Remove the rear cover.

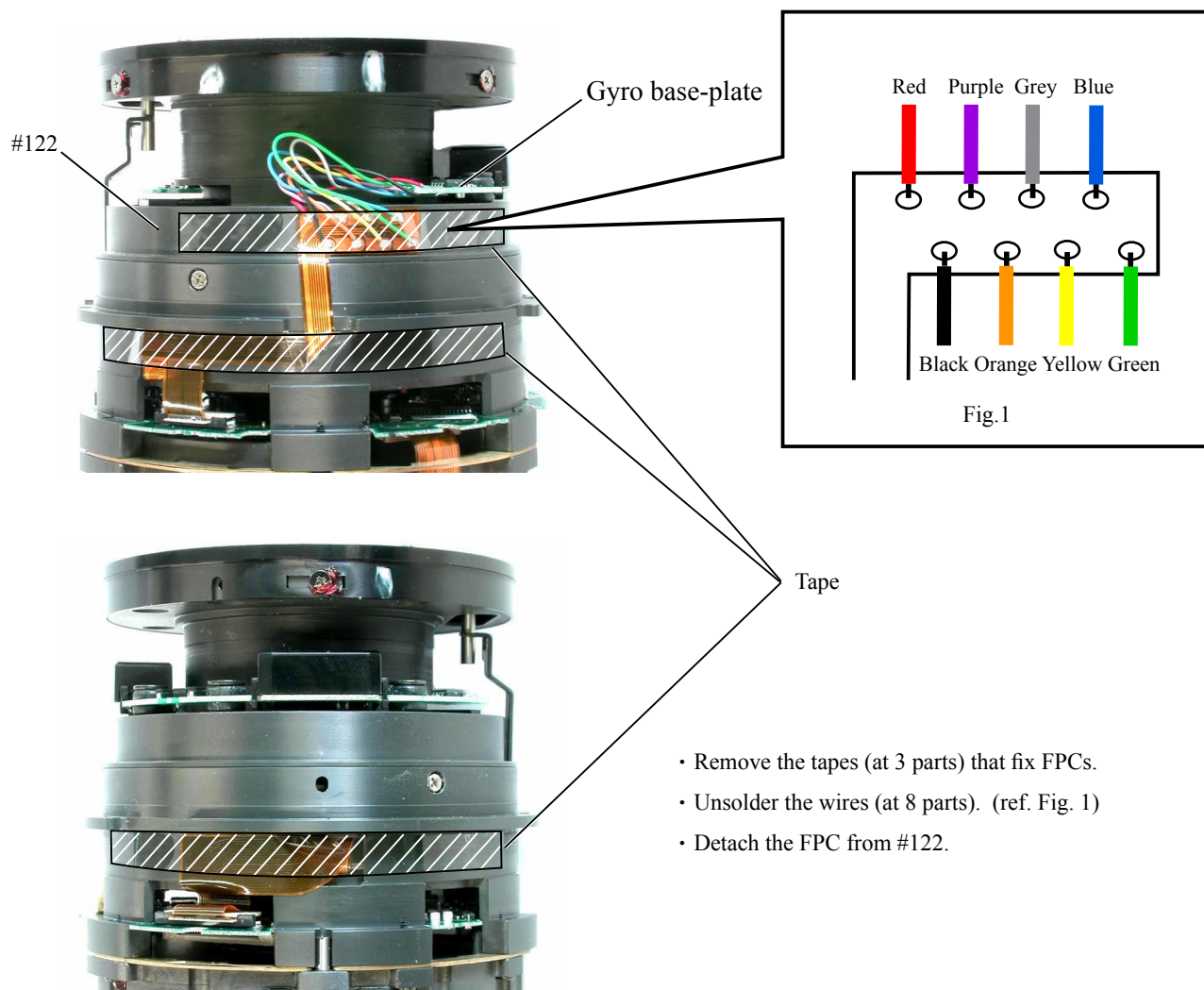
Separate Lens body and Rear lens group



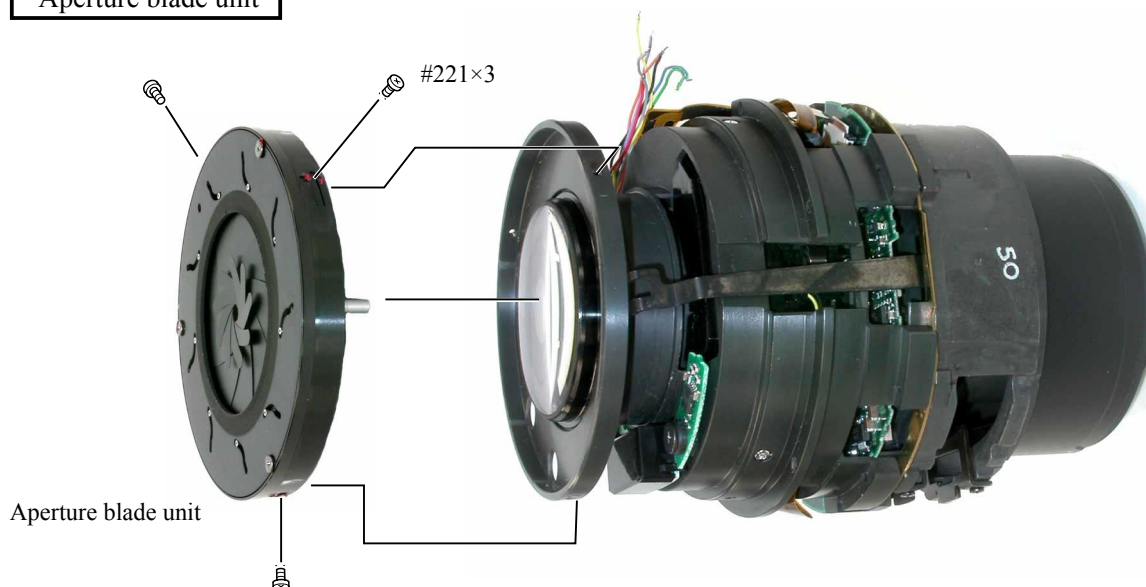
- Disconnect the connectors (at 2 parts). (ref. Fig. 1)
- Take out 6 screws (#241).
- Separate the rear lens group from the lens body.



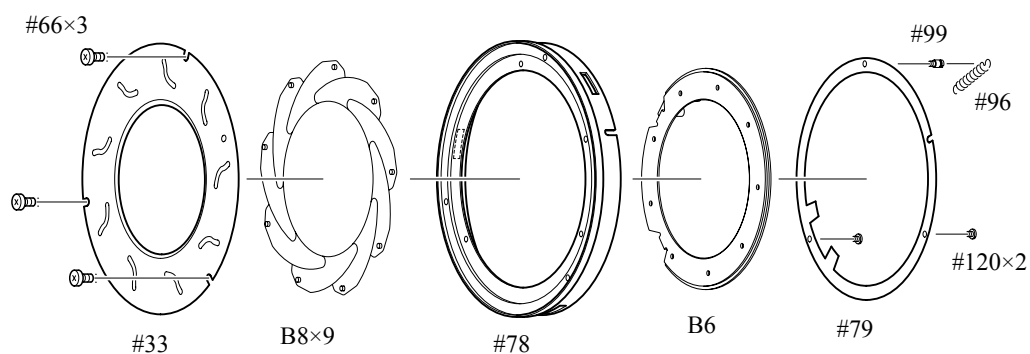
Unsolder Wires of Gyro base-plate



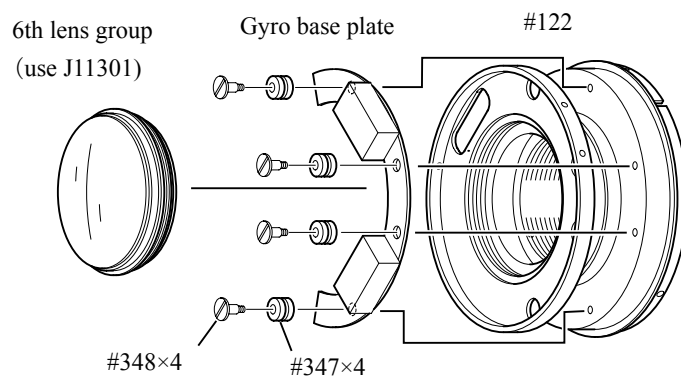
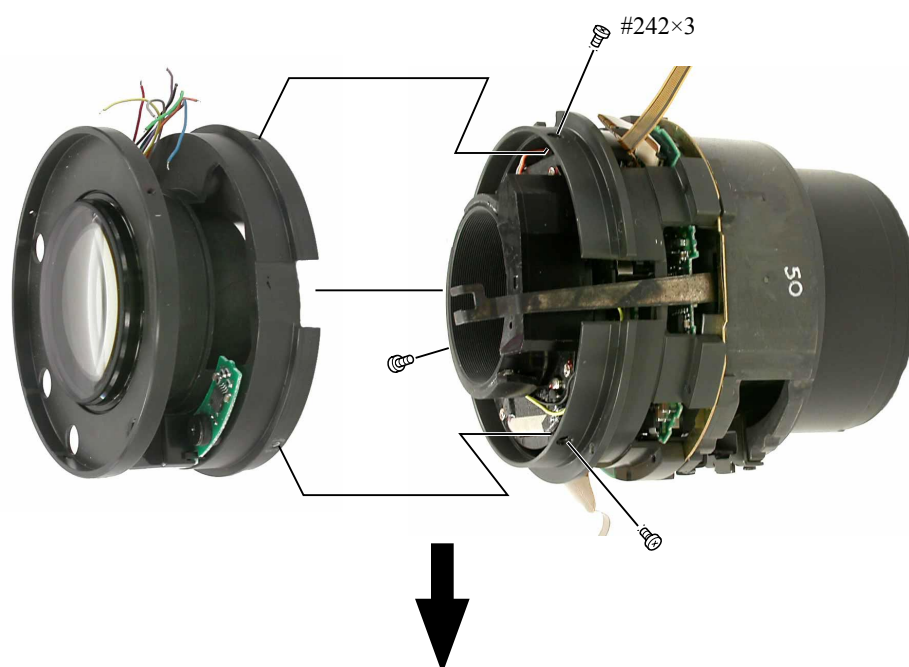
Aperture blade unit



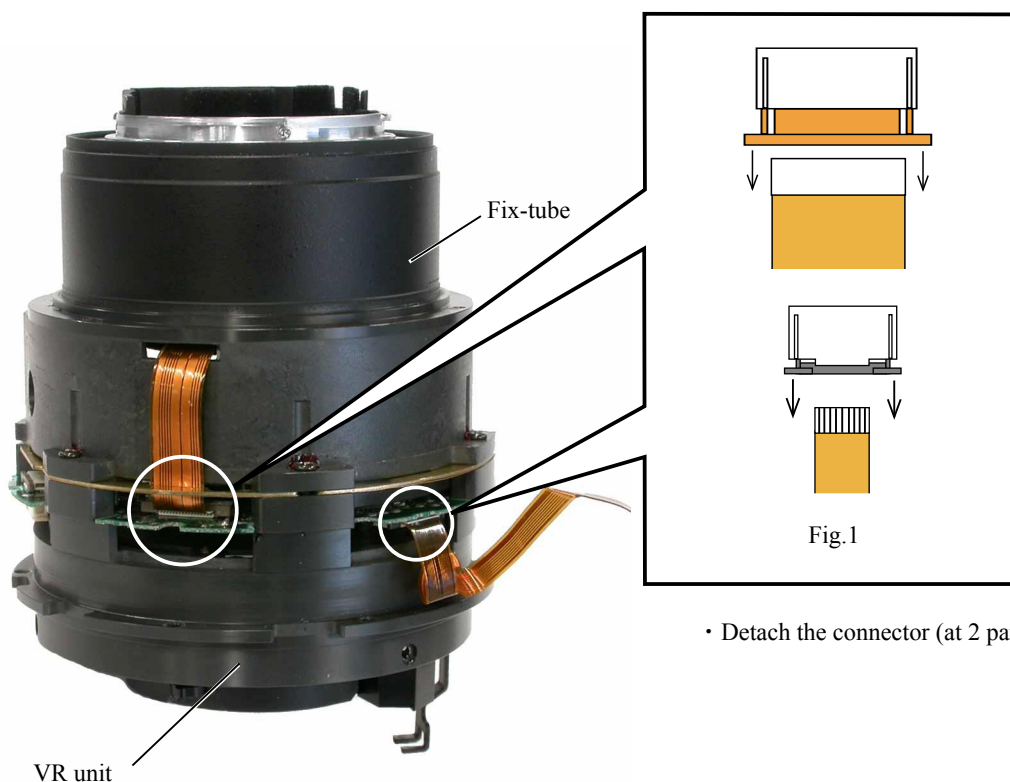
- Take out 3 screws (#221) and remove the aperture blade unit.



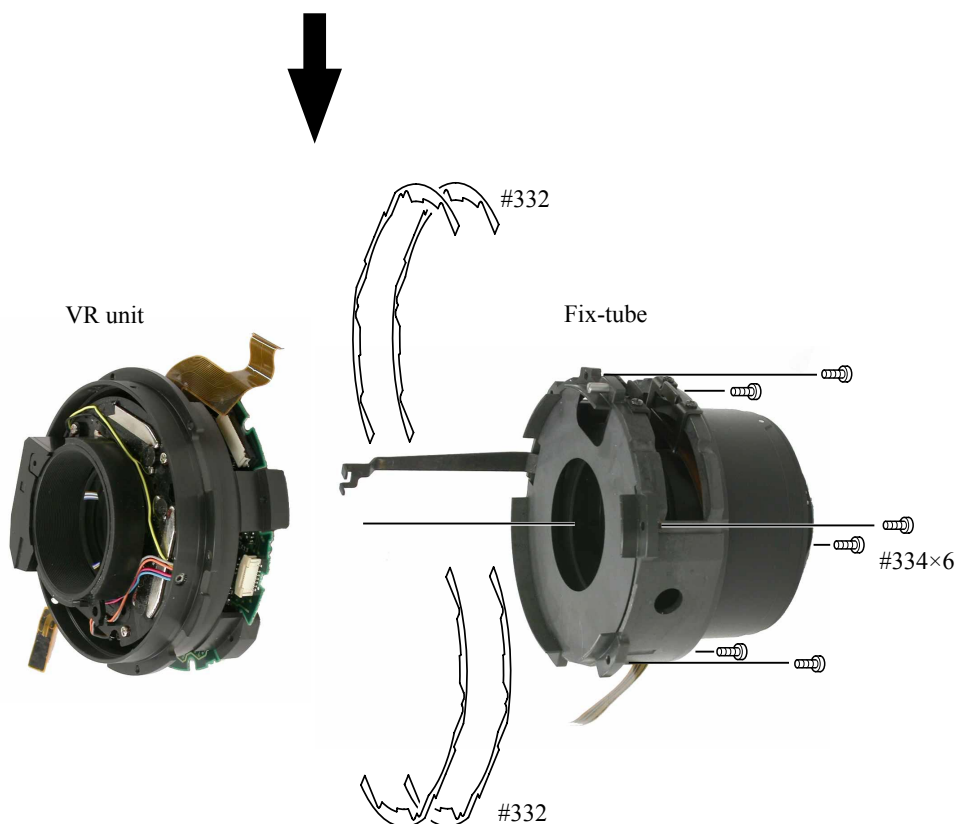
Gyro base-plate, 6th lens group



Separate Fix-tube and VR unit



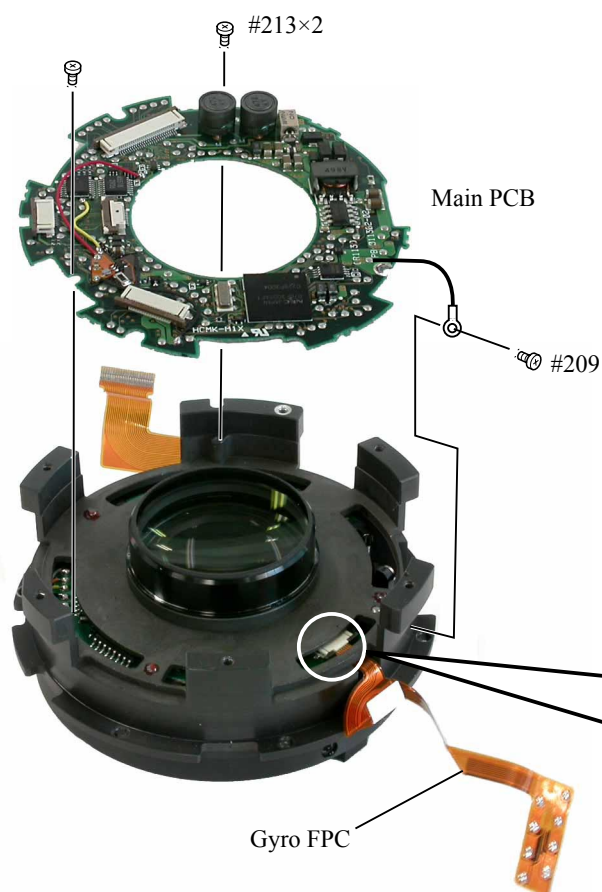
- Detach the connector (at 2 parts). (ref. Fig. 1)



- Take out 6 screws (#334), and separate the VR unit and fix-tube.

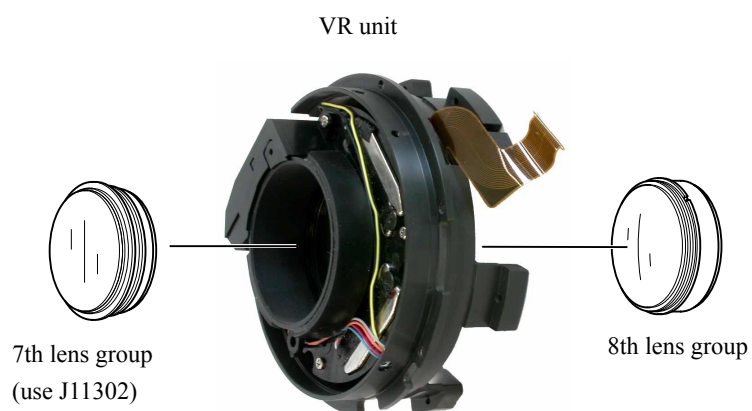
Note: Between the VR unit and the fix-tube, there are a few washers (#332) for F.F.D adjustment inserted in either side. So do NOT mix up the washers of both sides.

Main PCB



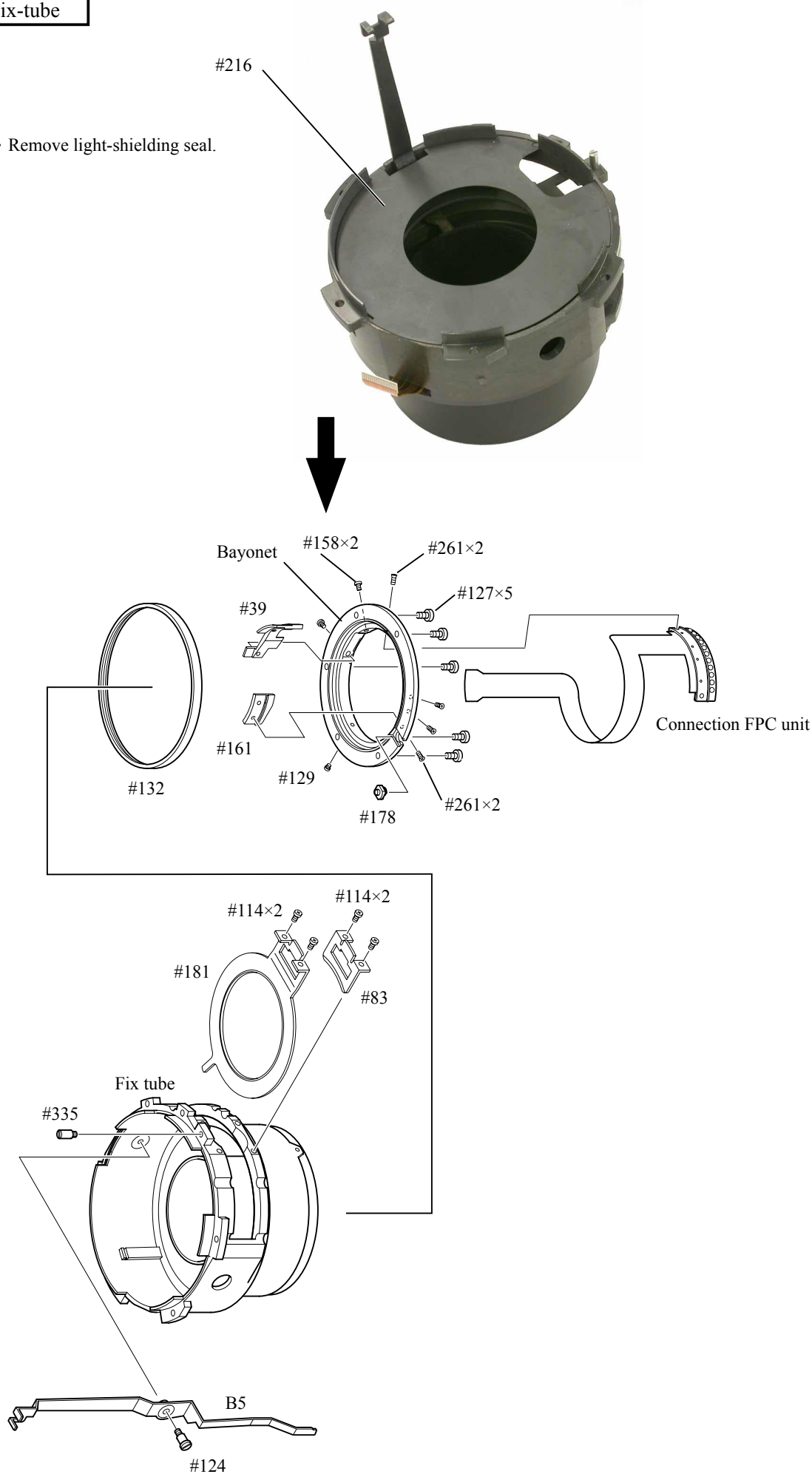
- Disconnect the connector. (ref. Fig. 1)

VR unit



Bayonet, Fix-tube

- Remove light-shielding seal.



Change-switch unit



- Take out 2 screws (#311), and lift the change-switch unit slightly.

Note : Handle the FPC of the change-switch unit carefully because it is easily cut off.

Tripod ring unit

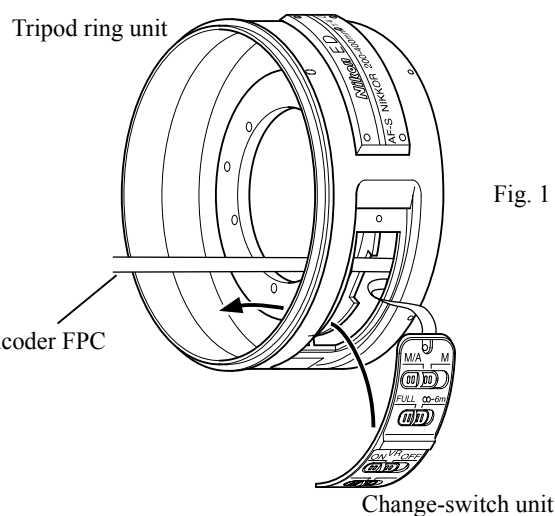


Fig. 1

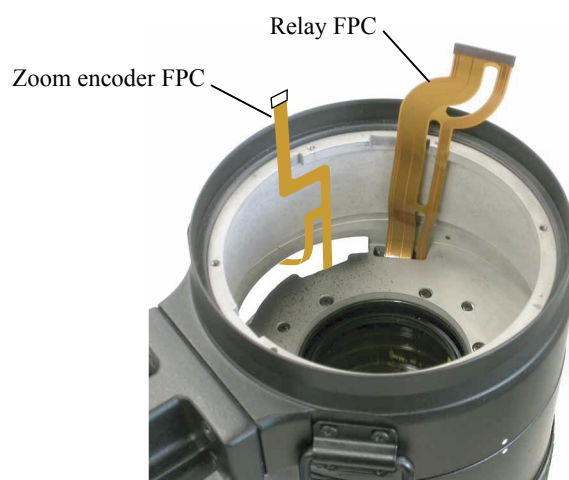
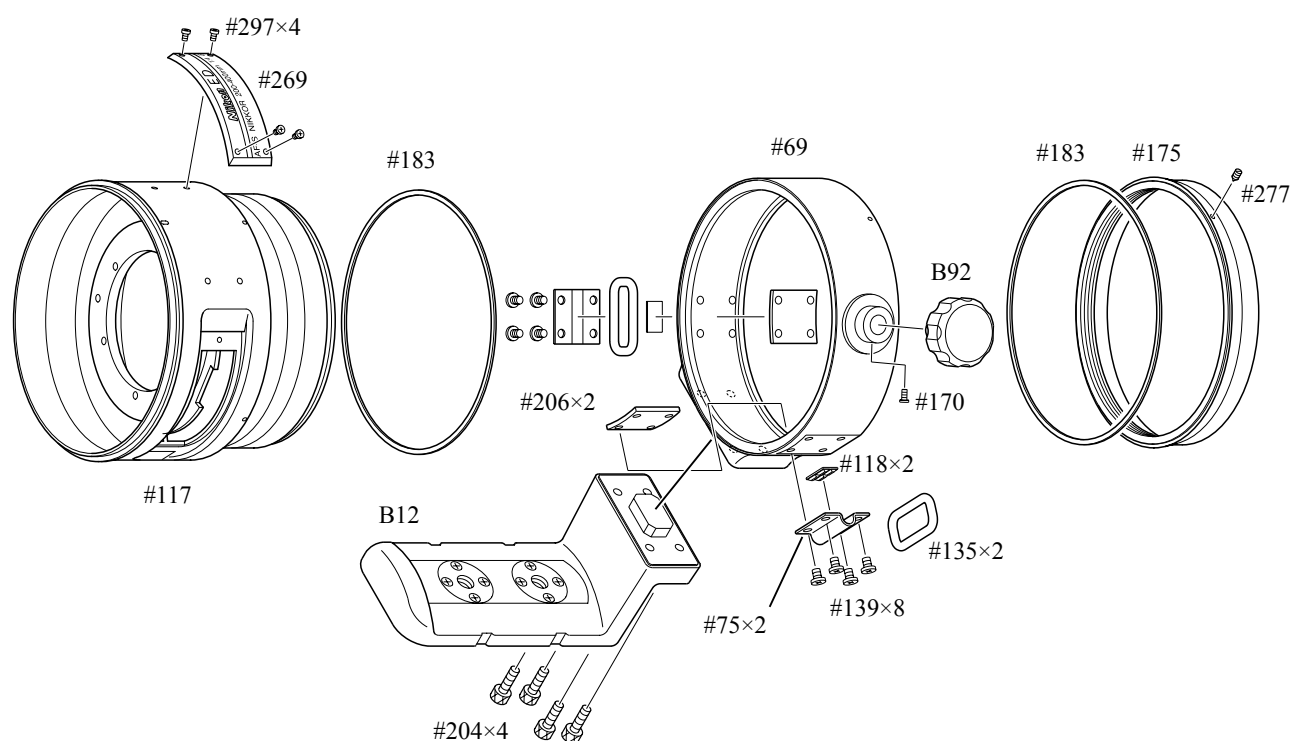


Fig. 2

- Take out 6 screws (#241) and 3 screws (#284), and lift the tripod ring unit slightly.
- Unfasten and pass the change-switch unit through the switch attaching hole of the tripod ring. (ref. Fig.1)
- Pull the zoom encoder FPC and relay FPC out of the hole of the tripod ring unit. (ref. Fig. 2)
- Remove the tripod ring unit.

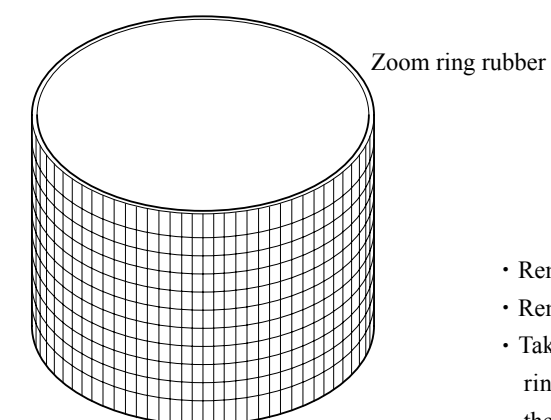


5th lens group

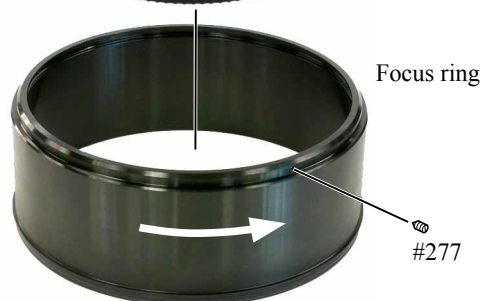
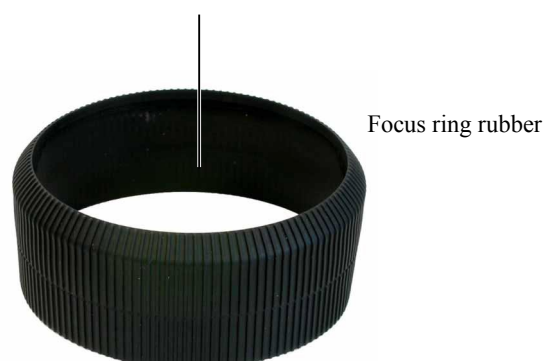


- Set the zoom ring to the TELE side.
- Remove the 5th lens group.

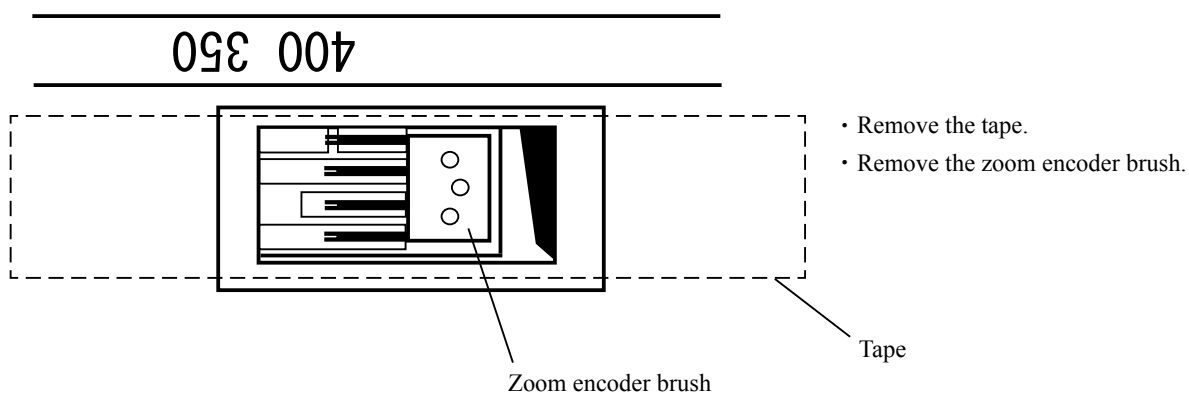
Focus ring, Focus ring rubber, Zoom ring rubber



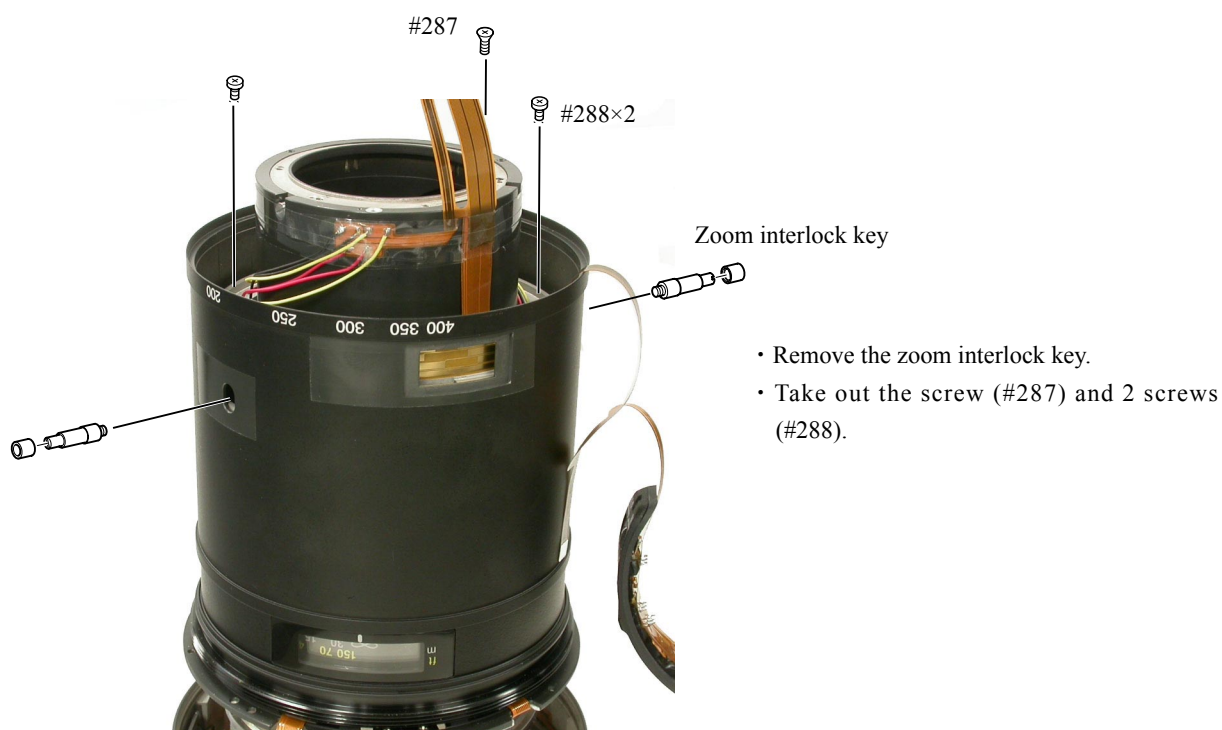
- Remove the zoom ring rubber.
- Remove the focus ring rubber.
- Take out the screw (#277) and remove the focus ring by turning it in the direction indicated by the arrow.



Zoom encoder brush

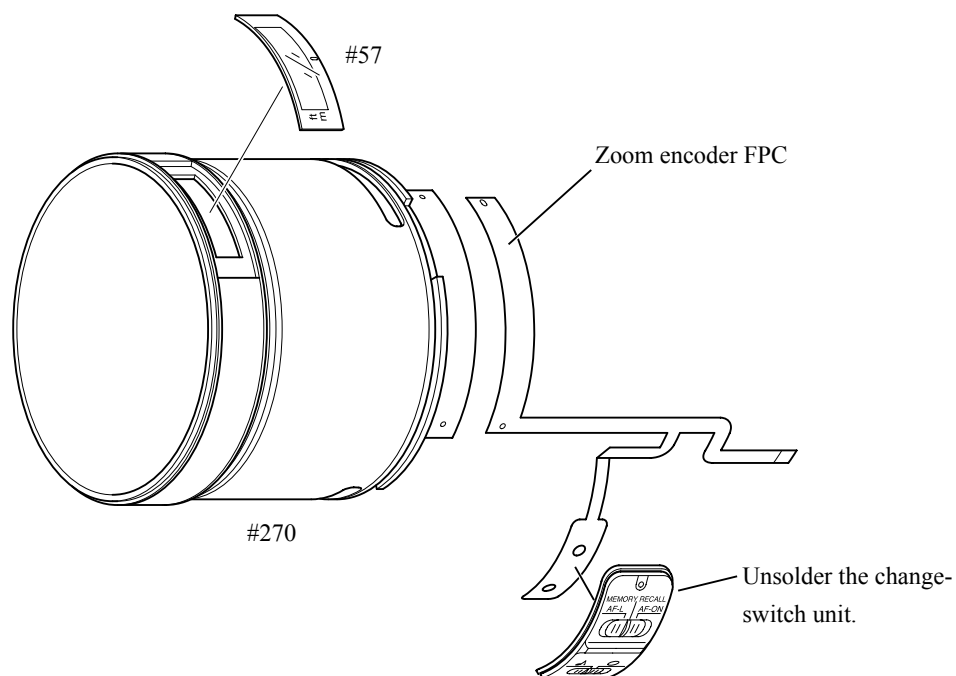


Zoom ring

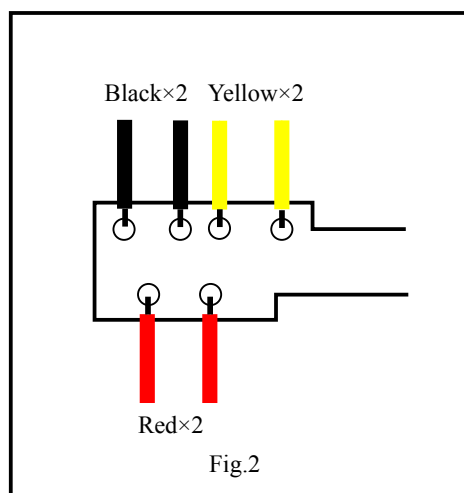




Zoom encoder FPC



Power-brush



- Remove the tape that fixes the FPC. (ref. Fig. 1)
- Unsolder the 6 wires of the power-brush. (ref. Fig. 2)

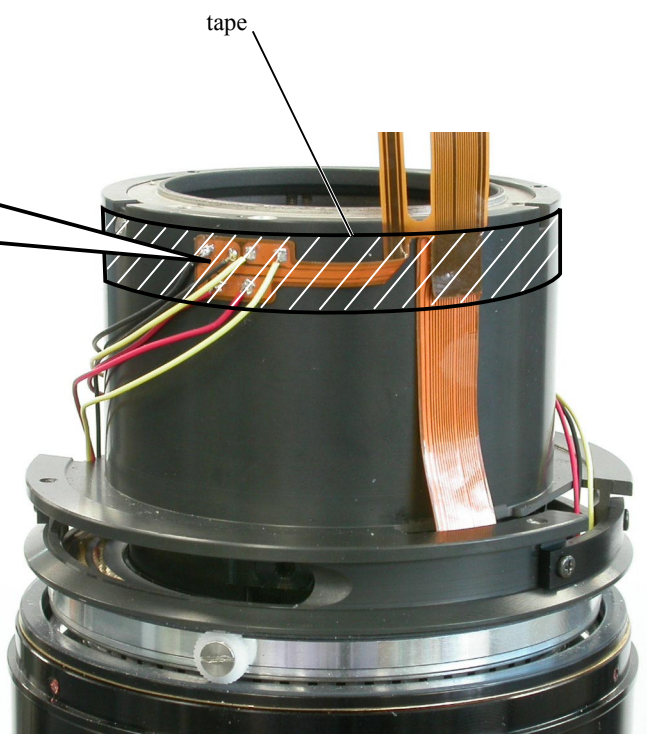
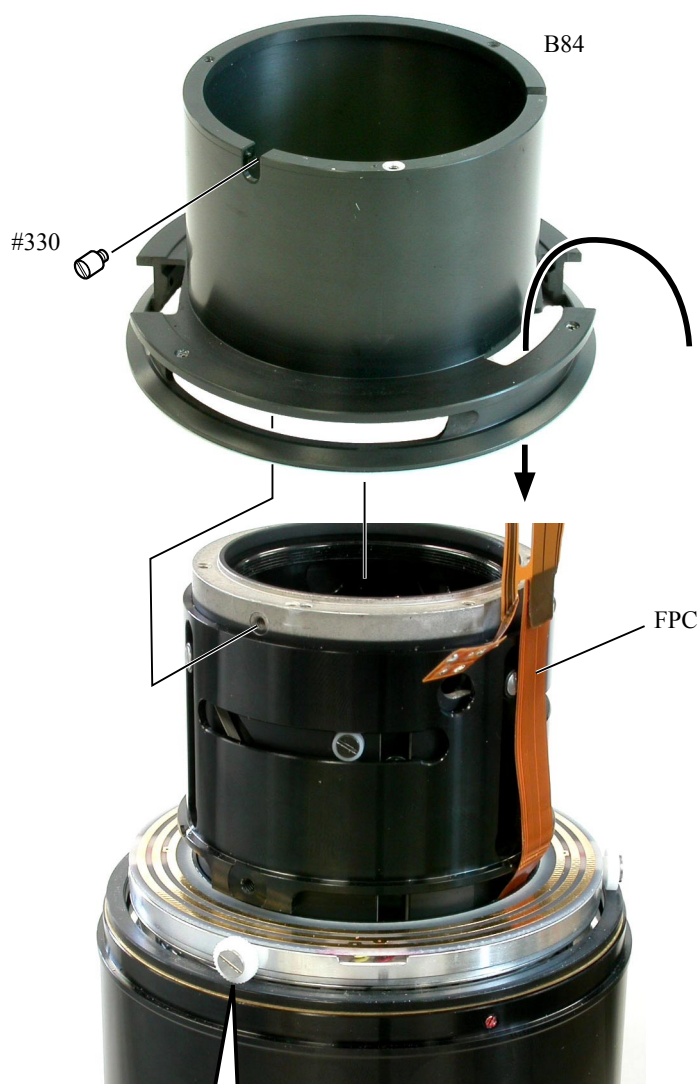


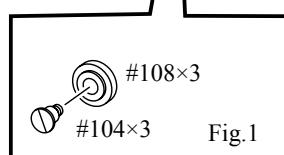
Fig.1



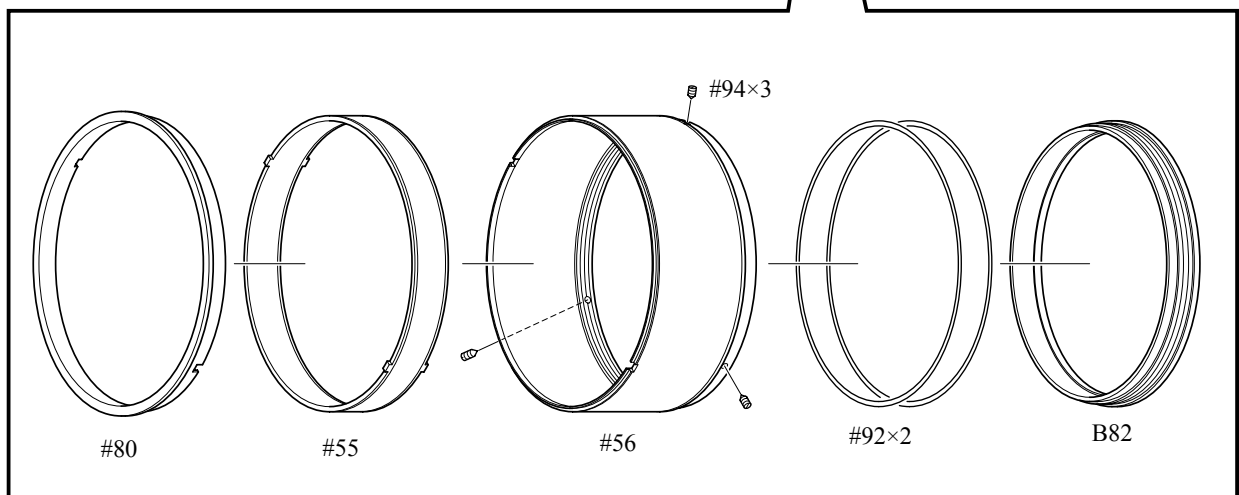
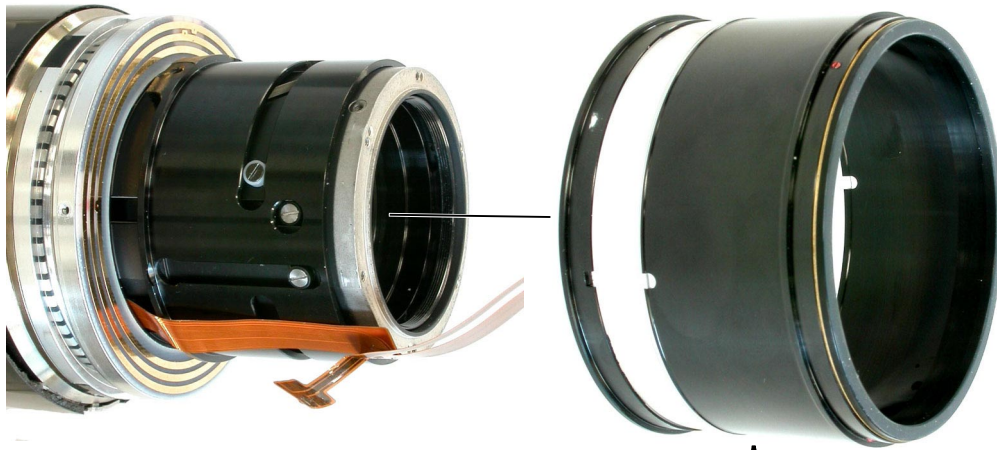
Distance scale window unit



- Take out the screw (#330).
 - Pass the FPC through the hole of B84, and detach the B84.
- Note: Do NOT damage FPC.**
- Take out 3 screws (#104) and remove 3 rollers (#108). (ref. Fig. 1)



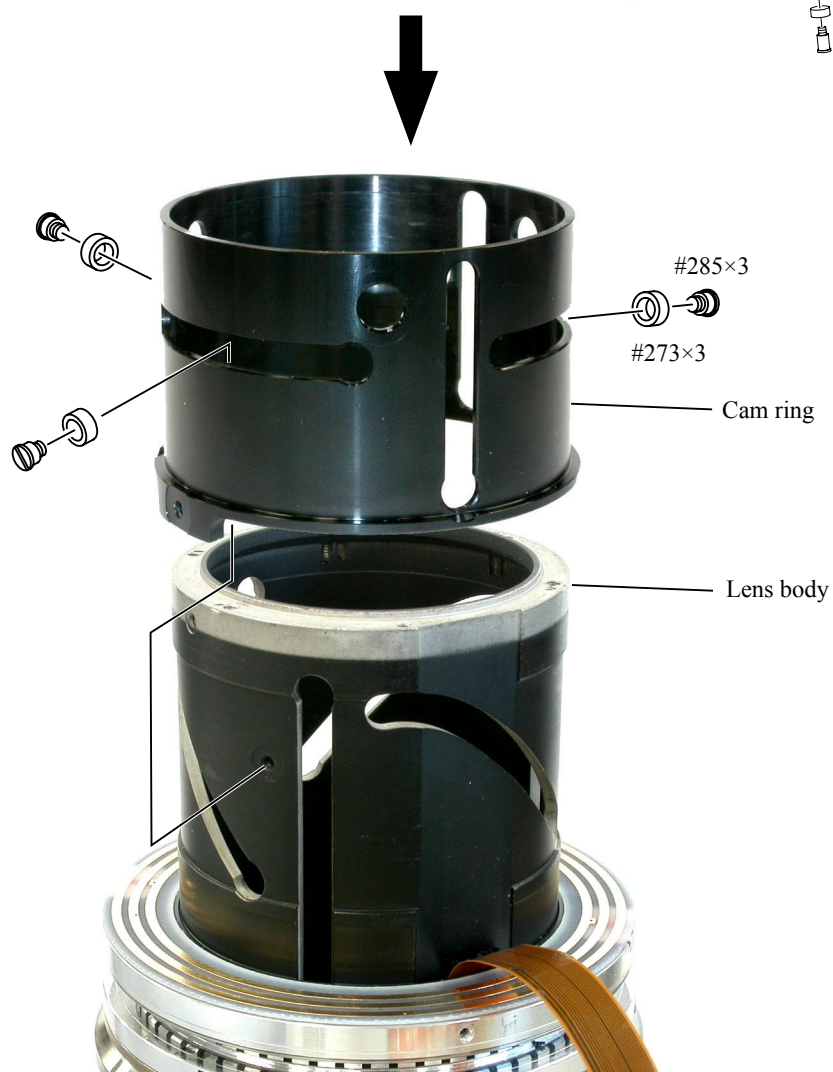
Distance scale window unit



Exploded view diagram of the 4th sliding ring assembly. The diagram shows the 4th sliding ring (a black ring) being positioned onto the main assembly. The main assembly includes a black cylindrical component with a silver-colored ring and a black ring. The exploded view shows the 4th sliding ring being positioned onto the main assembly. The exploded view shows the 4th sliding ring being positioned onto the main assembly. The exploded view shows the 4th sliding ring being positioned onto the main assembly.

4th sliding ring

#134×3
#133×3
#143×3



SWM unit

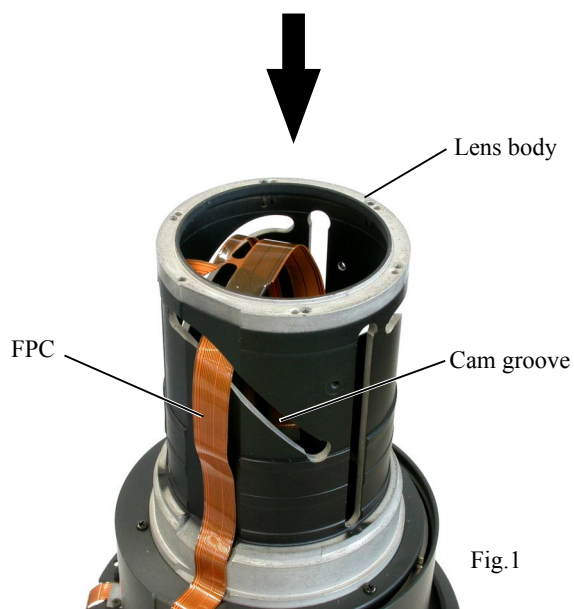
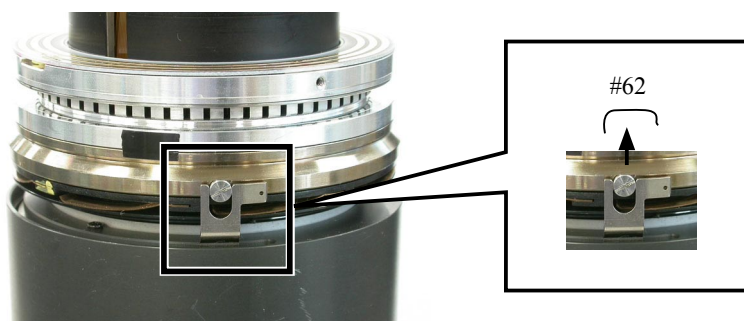
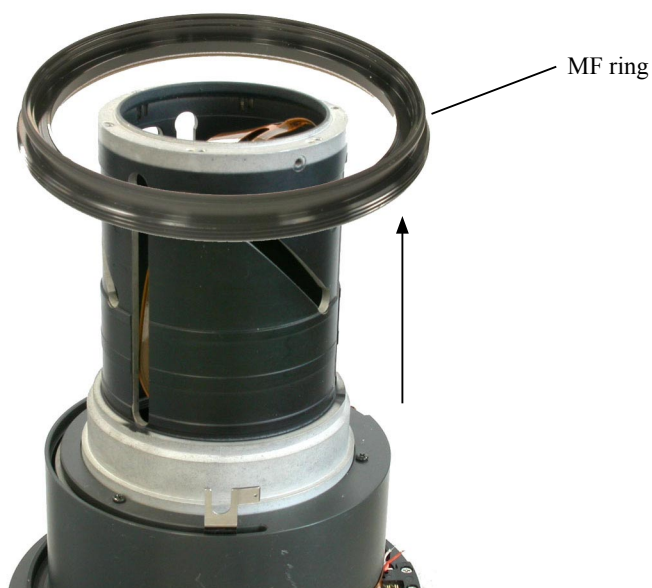


Fig.1

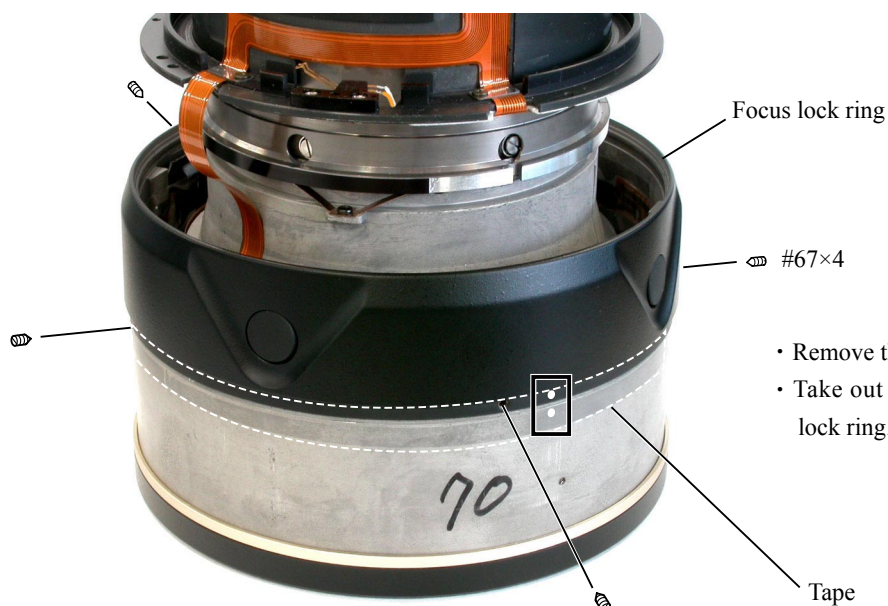
- Remove the spring (#62).
- When the SWM is detached, pass the FPC through the cam groove to store in the body so that the FPC is not damaged. (ref. Fig. 1)
- Remove the SWM.



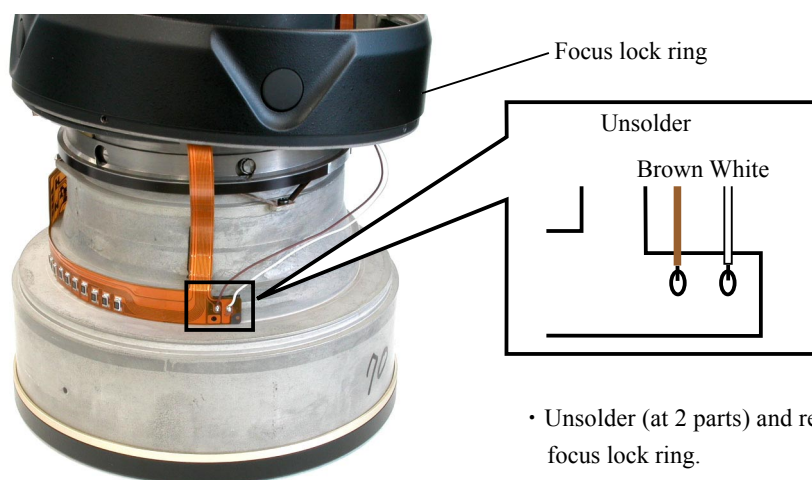
MF ring



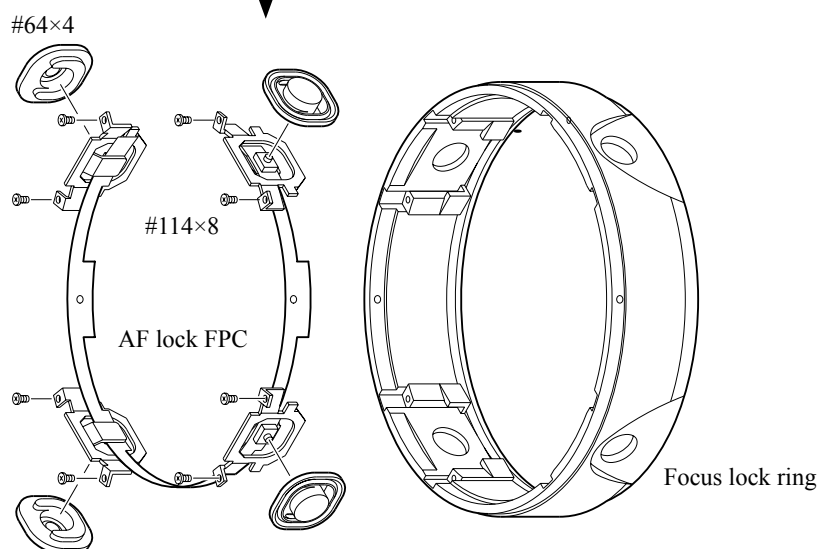
Focus lock ring



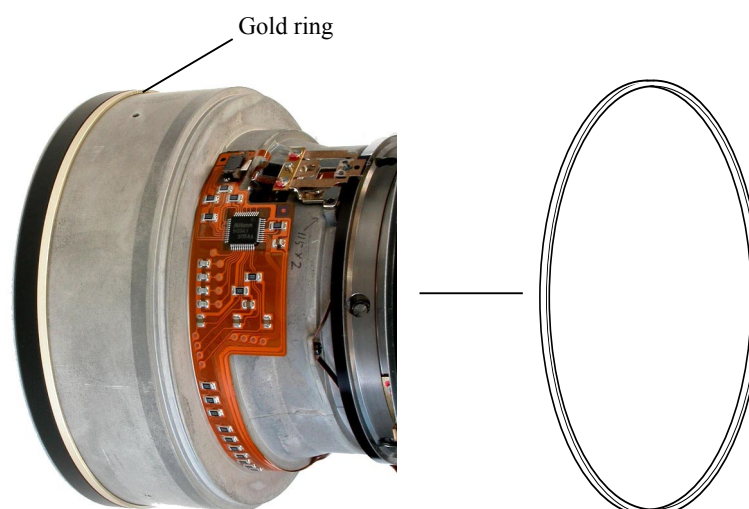
- Remove the tape.
- Take out 4 screws (#67) and lift up the focus lock ring.



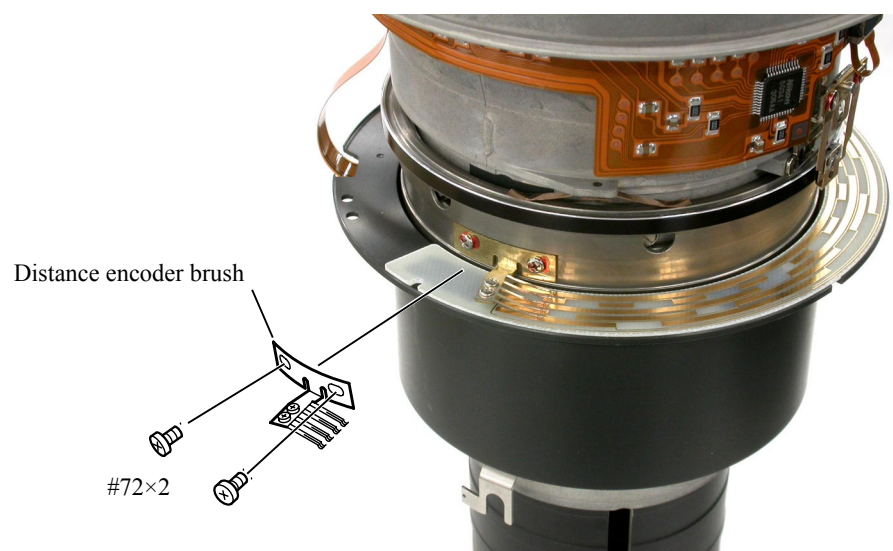
- Unsolder (at 2 parts) and remove the focus lock ring.



Remove Gold ring

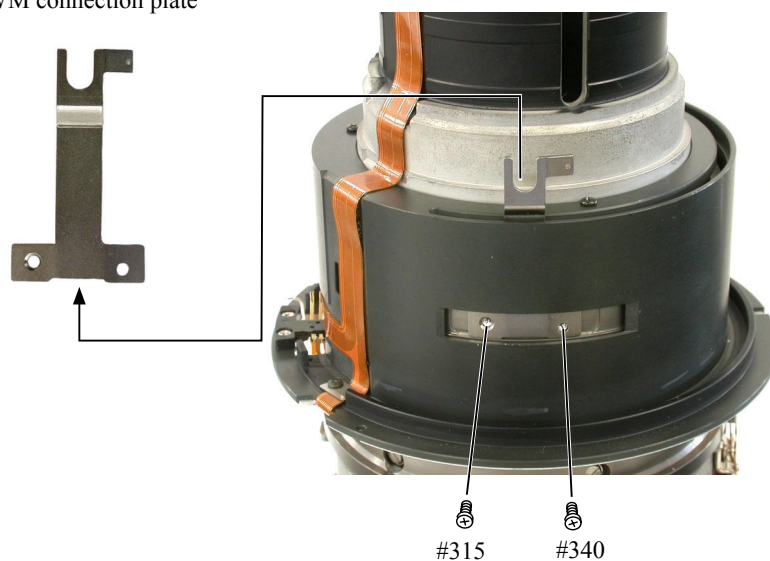


Distance encoder brush



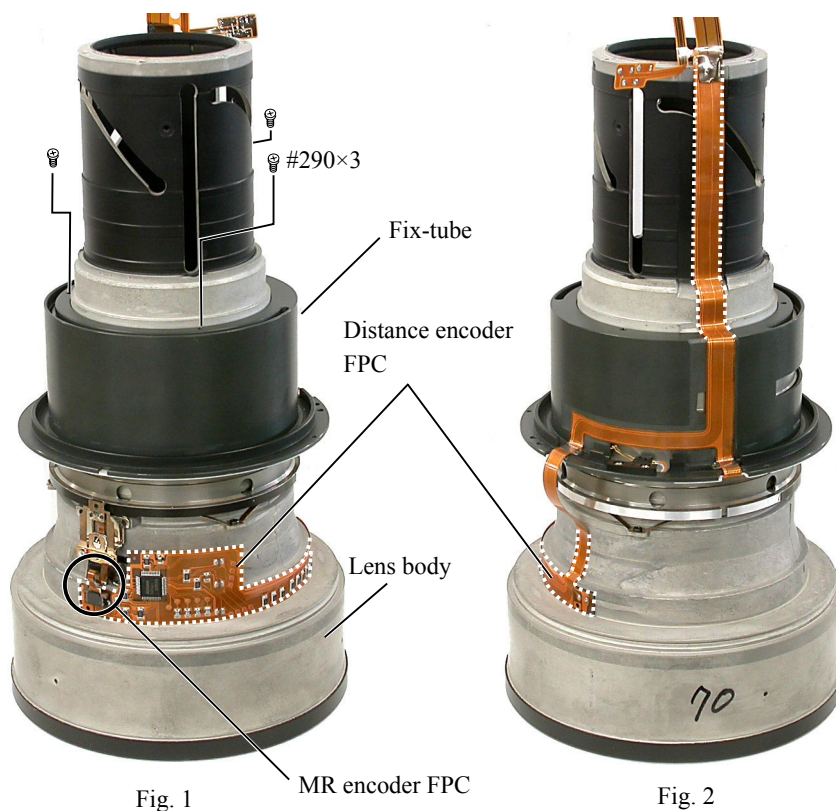
SWM connection plate

SWM connection plate



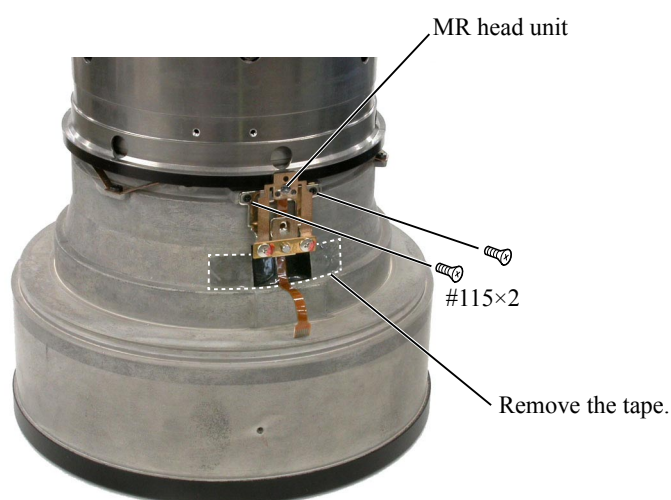
- Take out the screws (#315 and #340), and remove the SWM connection plate.

Remove Fix-tube



- Detach the MR encoder FPC from the connector.
- Detach the distance encoder FPC partially, which is attached on the lens body.
(as shown by broken lines of Fig. 1 and Fig. 2)
- Take out 3 screws (#290) and remove the fix-tube.

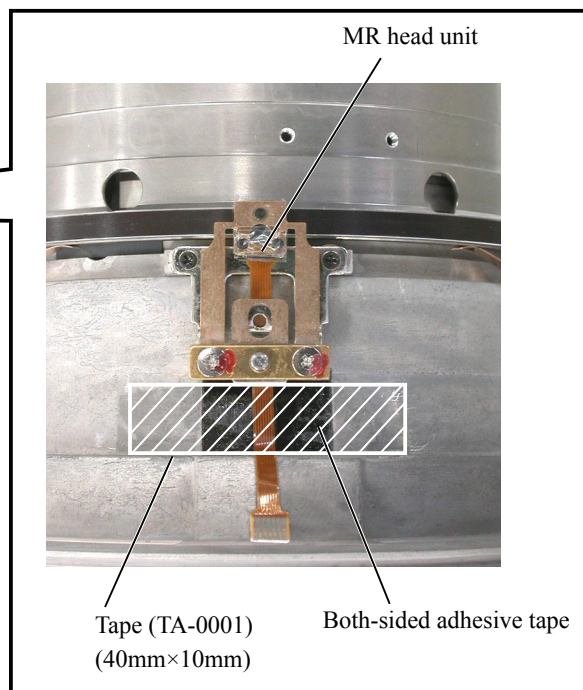
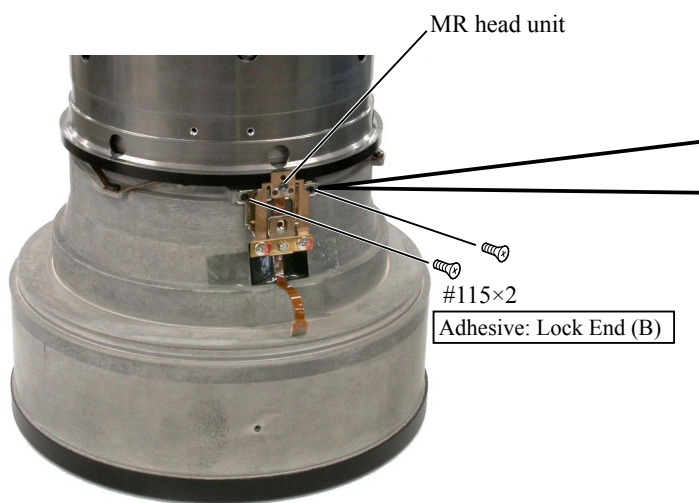
MR head



Assembly

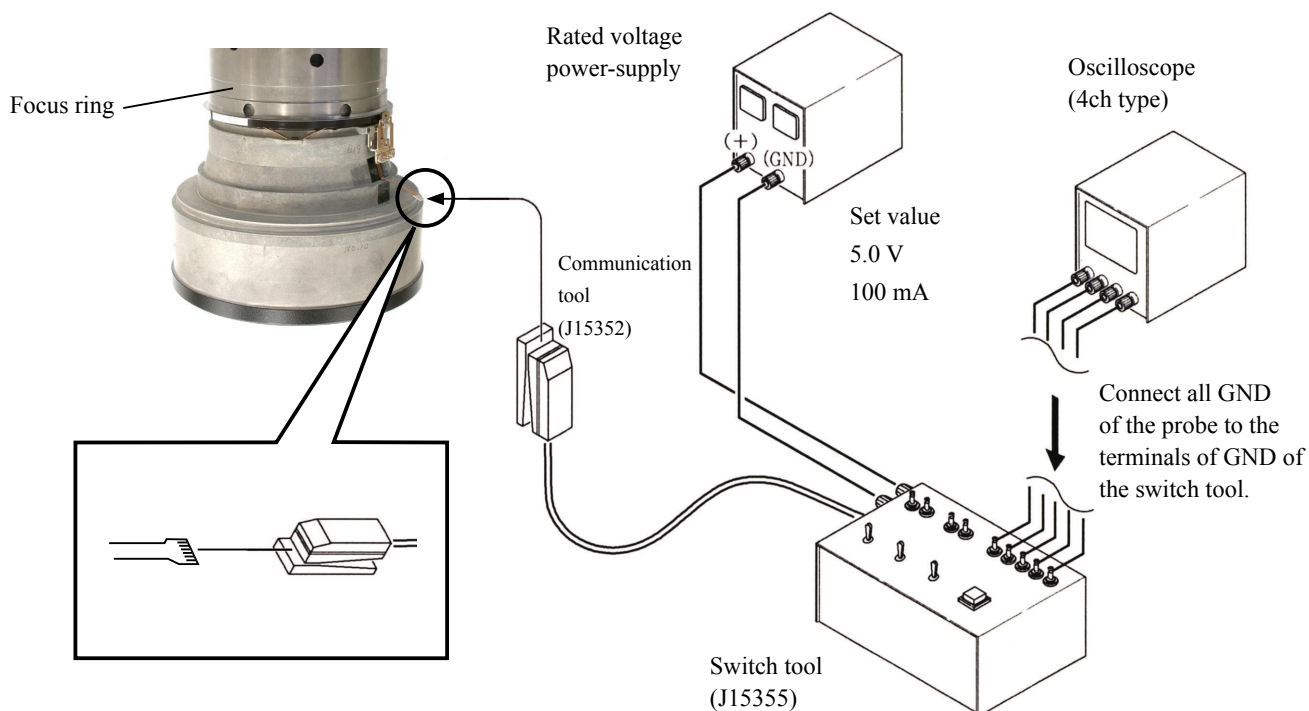
MR encoder output waveform adjustment

- When the MR head is disassembled or replaced, be sure to make an adjustment.



- Attach the tape (TA-0001) on the MR head FPC that is fixed with the both-sided adhesive tape.

【Attachment diagram】



• How to inspect and adjust:

- ① Turn the switch 1 to OFF, switch 2 to OFF and switch 3 to ON of the Switch tool.
- ② Confirm that the electric current and voltage of the connected rated voltage power-supply are set values, then turn it ON.
- ③ Set the oscilloscope and turn the focus ring manually.
- ④ Check the waveform of the oscilloscope by stopping with "START/STOP" key.

Note : The waveform varies according to the rotational speed of the focus ring. So change "Time/Div" setting accordingly.

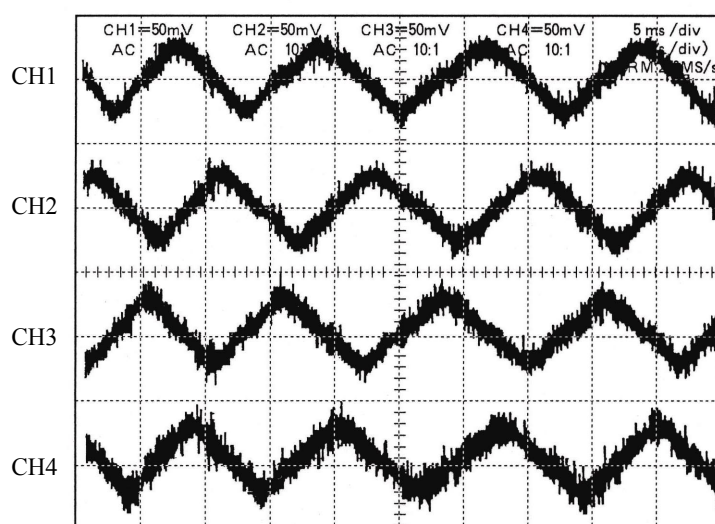


Fig.1

• Oscilloscope setting

V/Div (ch1)	: 50 mV
V/Div (ch2)	: 50 mV
V/Div (ch3)	: 50 mV
V/Div (ch4)	: 50 mV
Coupling	: AC
Time/Div	: 5 m Sec
Trigger Mode	: NORMAL
Trigger Coupling	: AC

- ⑤ In case large waveform-noise (as shown in Fig. 1) is detected, use the FILTER function to become Fig. 2.

How to set FILTER function (e.g. DL1540 manufactured by YOKOGAWA)

1. Press the FILTER button.
2. Select "Smooth" of the menu on screen and turn it ON.

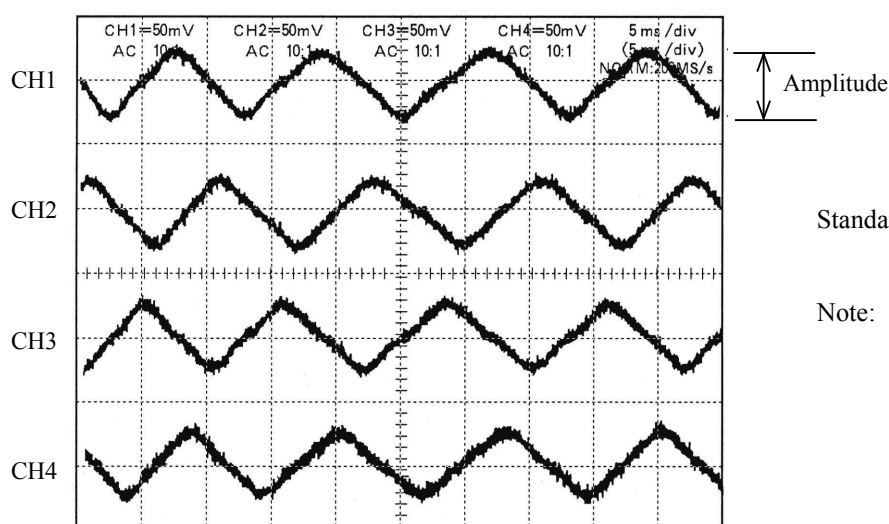


Fig.2

Standard: Amplitude of all pulses/
waveforms is 50mV or more.

Note: Check the waveform by moving the
focus ring back and forth from the
infinity-end to the close-end posi-
tions entirely.

- ⑥ In case the amplitude is small, loosen 2 screws (#218) as shown in Fig. 1 and make an adjustment by moving the MR head.

Note: When adjustments are made, prevent the magnetic tape and MR head from touching the magnetized driver bit. Otherwise, the magnetic data may be damaged.

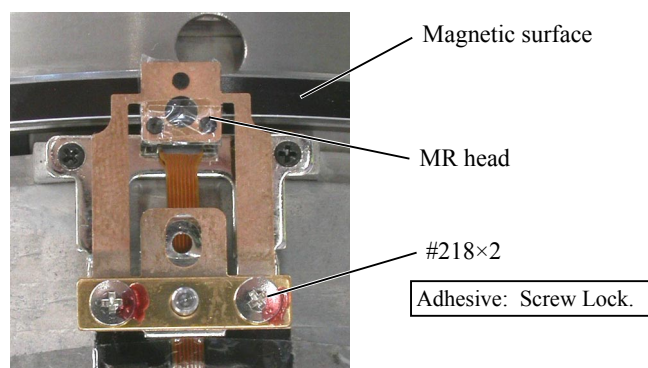


Fig.1

< Ref. >

- As shown in Fig. 2, if the amplitude of only either CH1&3 or CH2&4 is small, one of the 2 screws (#218) may be loosened, so check for it. If this is not the case, the MR head may malfunction, so be sure to replace the MR head unit (B19) and make a readjustment.

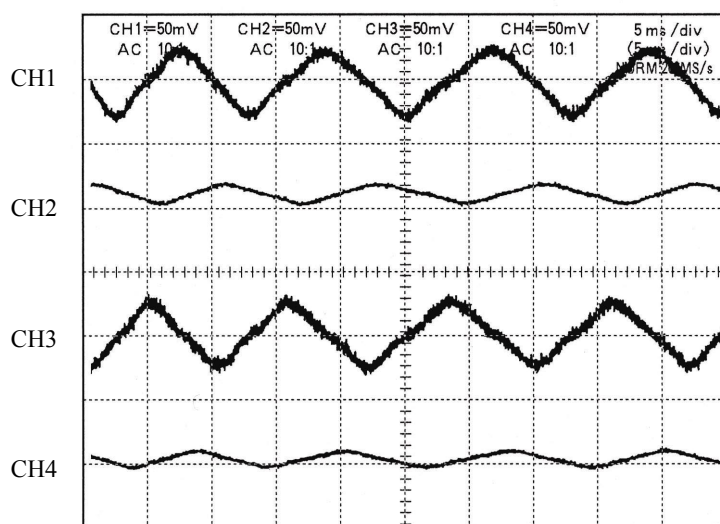


Fig.2

- As shown in Fig. 3, if the amplitude partially drops between the infinity and the close-distance, the magnetic data of the tape may be damaged. So replace the main fixed tube unit and make a readjustment. Replacing only the magnetic surface is impossible.

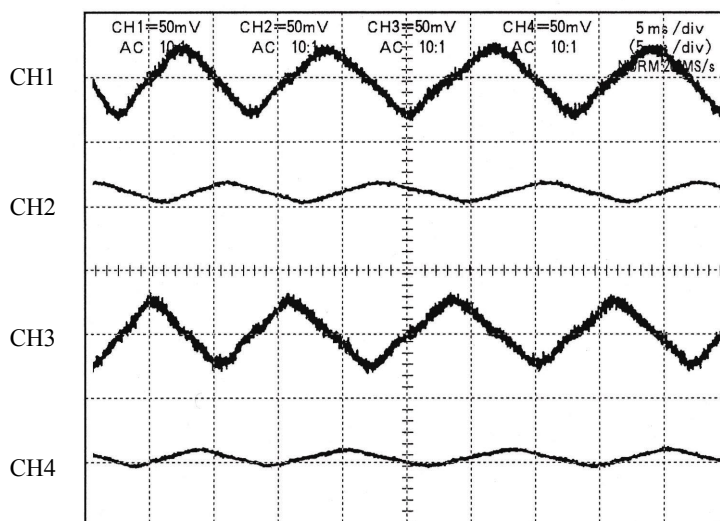
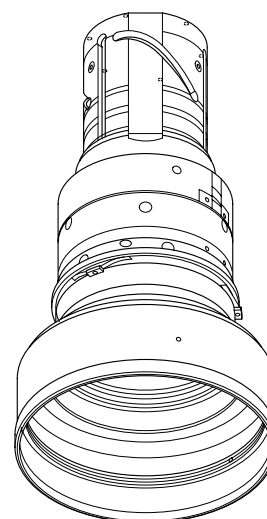


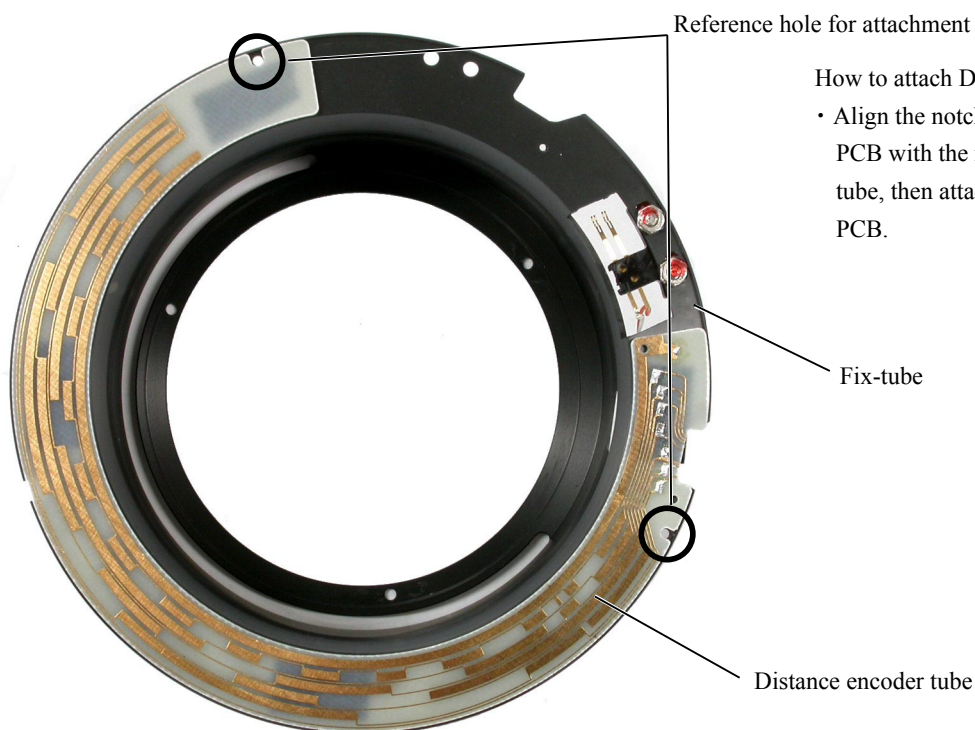
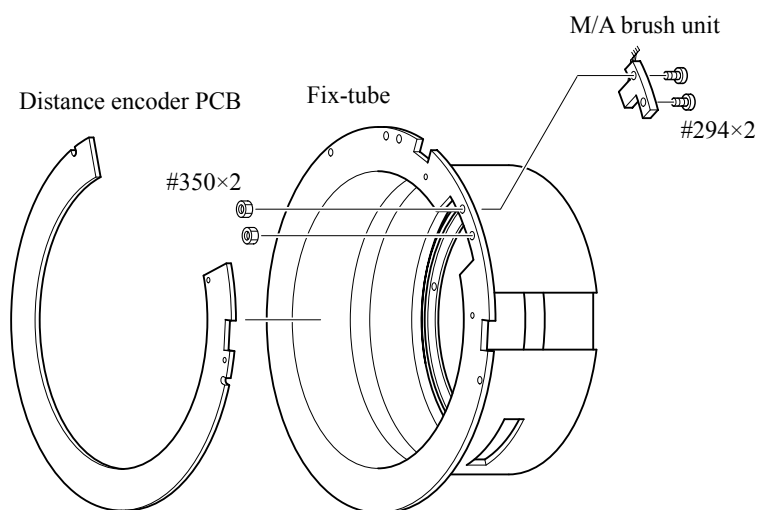
Fig.3

Main fixed tube unit



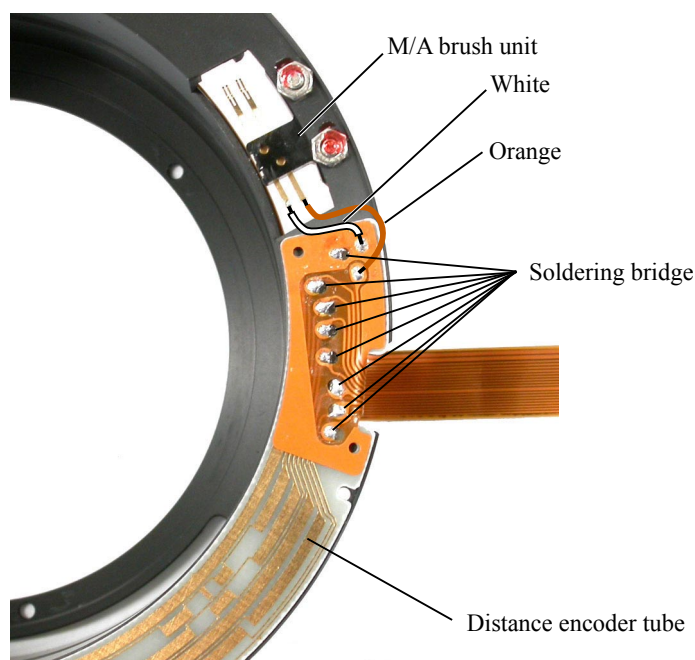
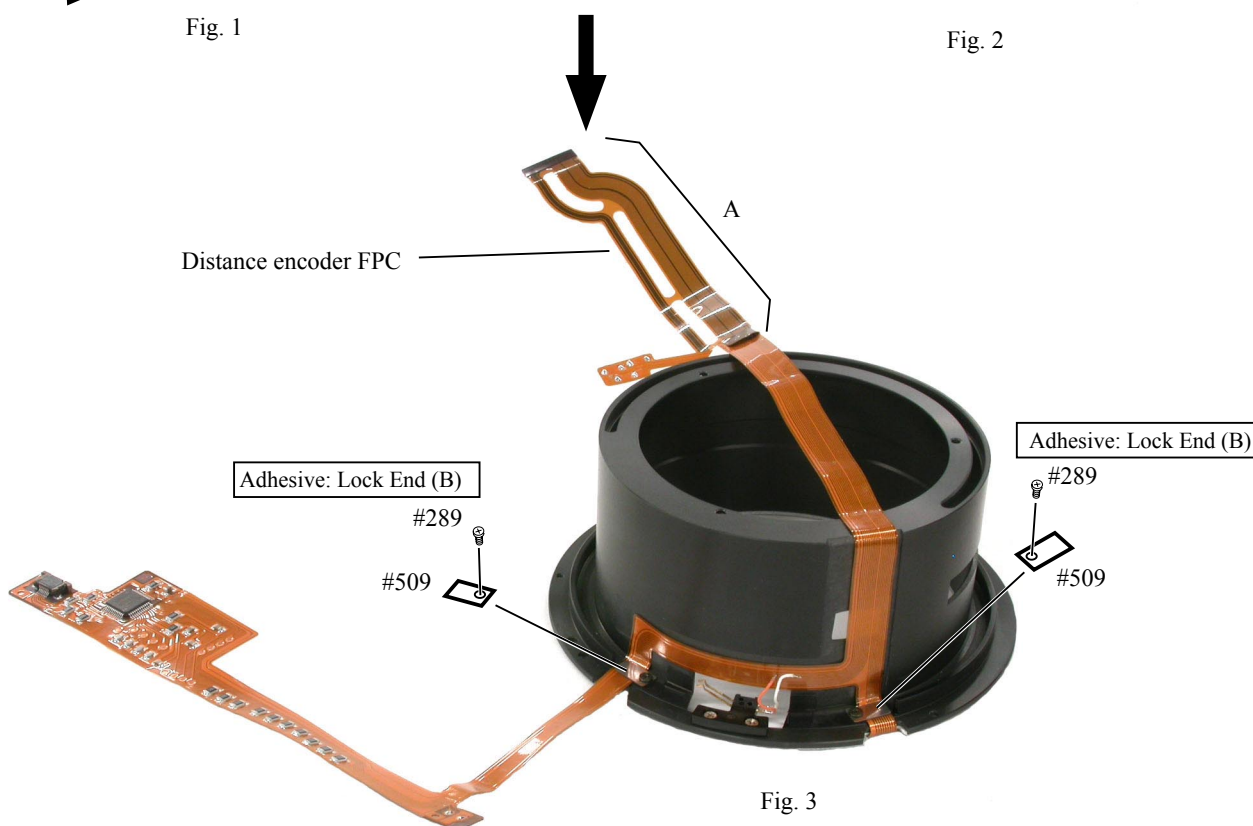
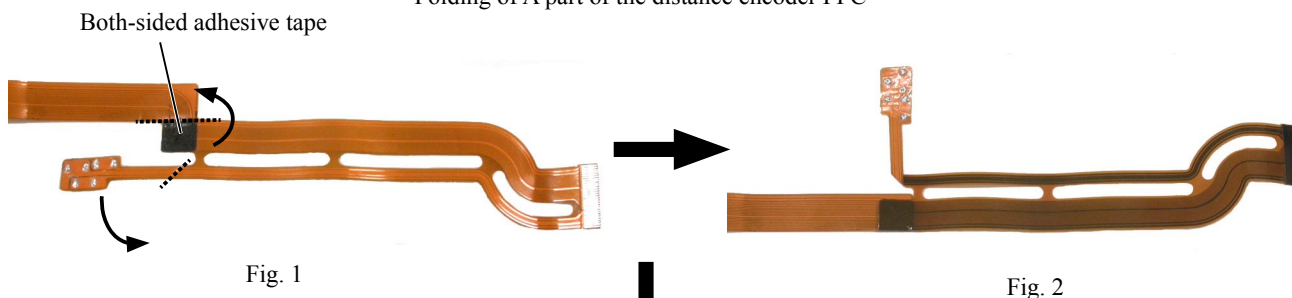
- ⑦ Turn off the rated voltage power-supply.

Fix-tube, Distance encoder PCB



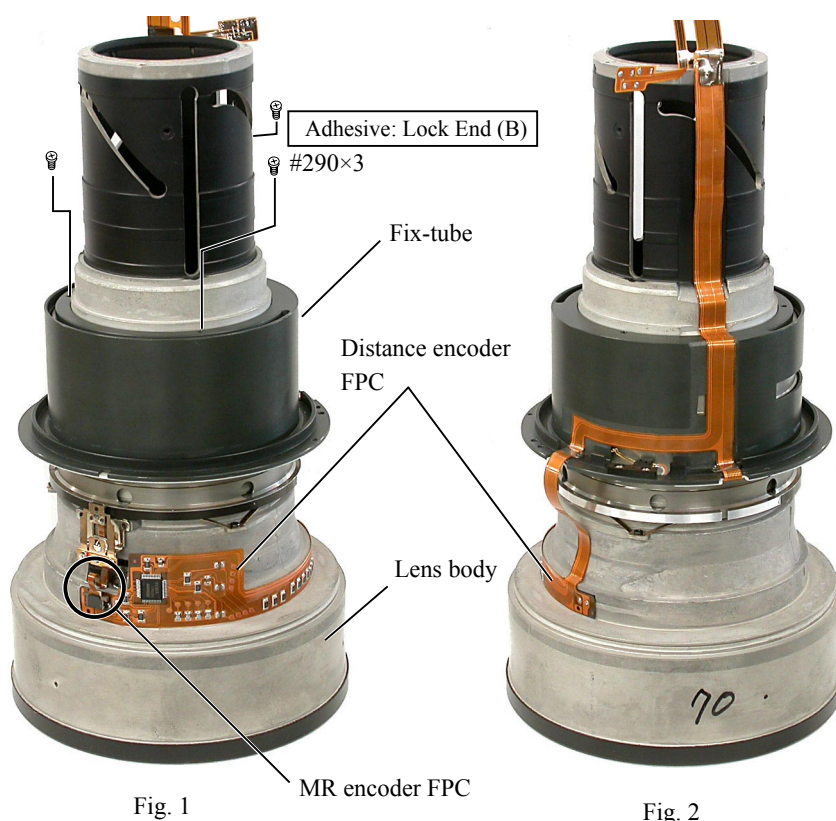
Distance encoder FPC

Folding of A part of the distance encoder FPC



- Fold the distance encoder FPC in the above A part along the broken line of Fig. 1. The result is as shown in Fig. 2.
- Attach the distance encoder FPC to the fix-tube. (ref. Fig. 3)
- Make 8 soldering bridges of the distance encoder FPC and the distance encoder PCB. (ref. Fig. 4)
- Solder the white and orange wires of the M/A brush unit. (ref. Fig. 4)

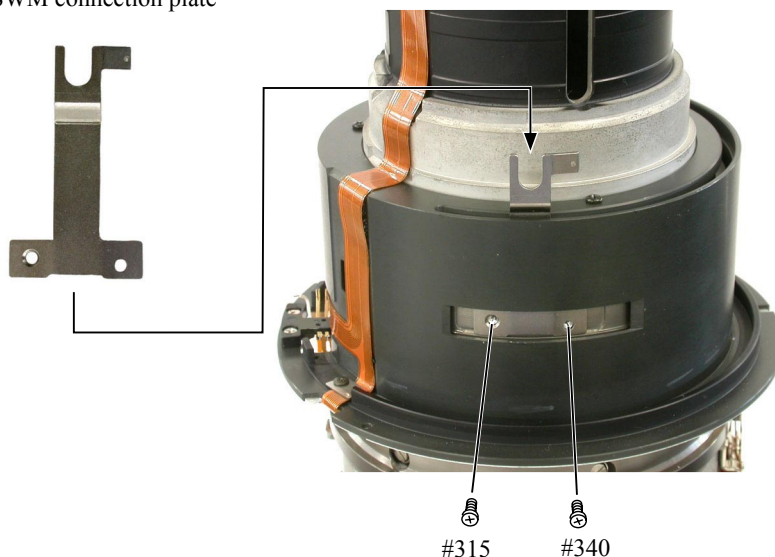
Assemble Fix-tube



- Assemble the fix-tube into the lens body, and fix it with 3 screws (#290).
- Attach the distance encoder FPC. (ref. Fig. 1 and Fig. 2)
- Insert the MR encoder FPC into the socket of the distance encoder FPC.

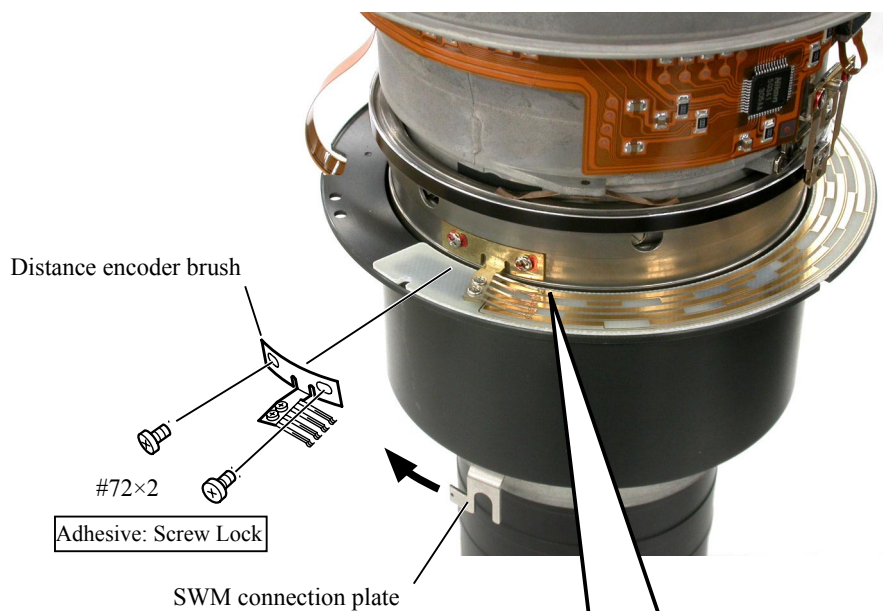
SWM connection plate

SWM connection plate

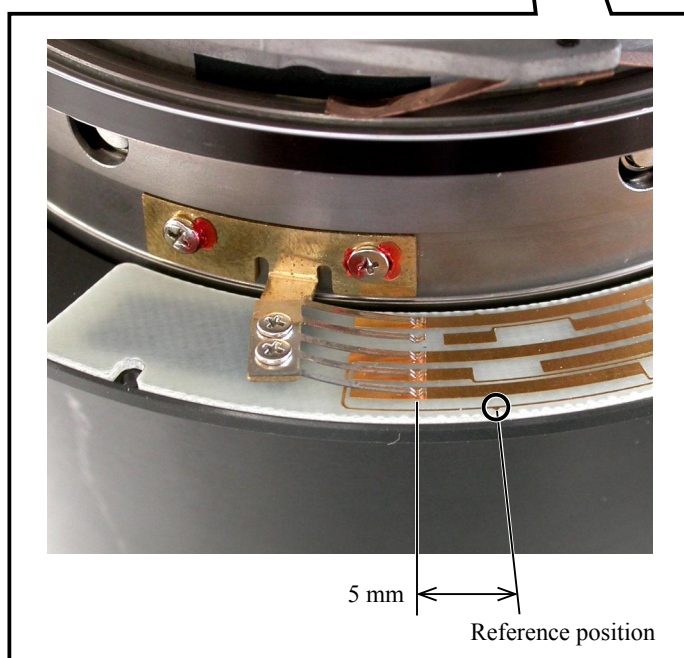


- Attach the SWM connection plate.
- Fix it with the screws (#315 and #340).

Distance encoder brush



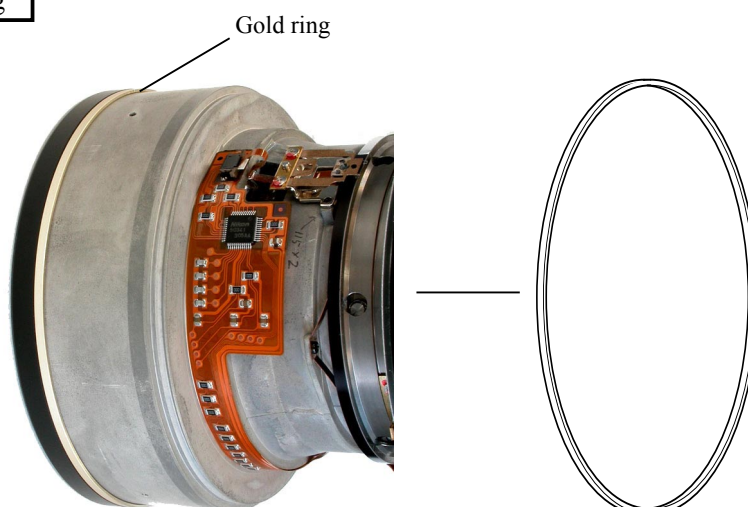
- Attach the distance encoder brush with 2 screws (#72).



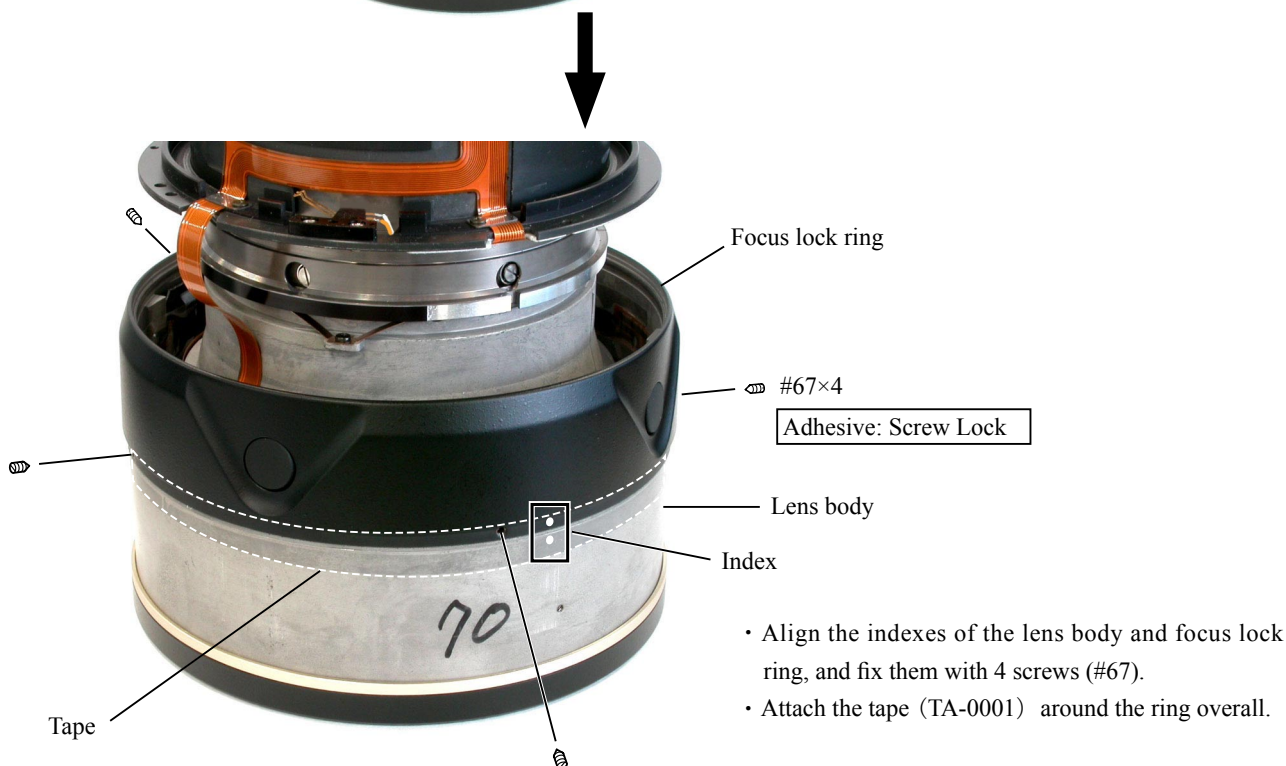
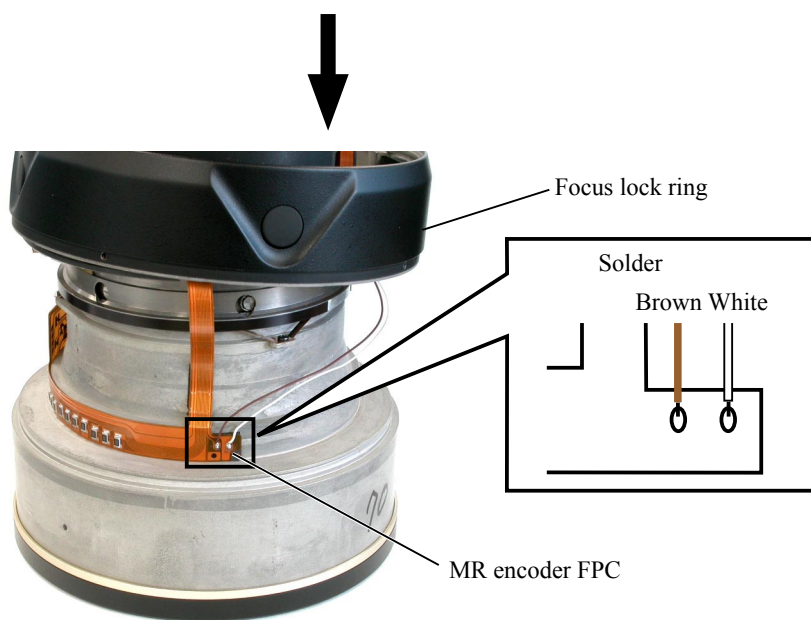
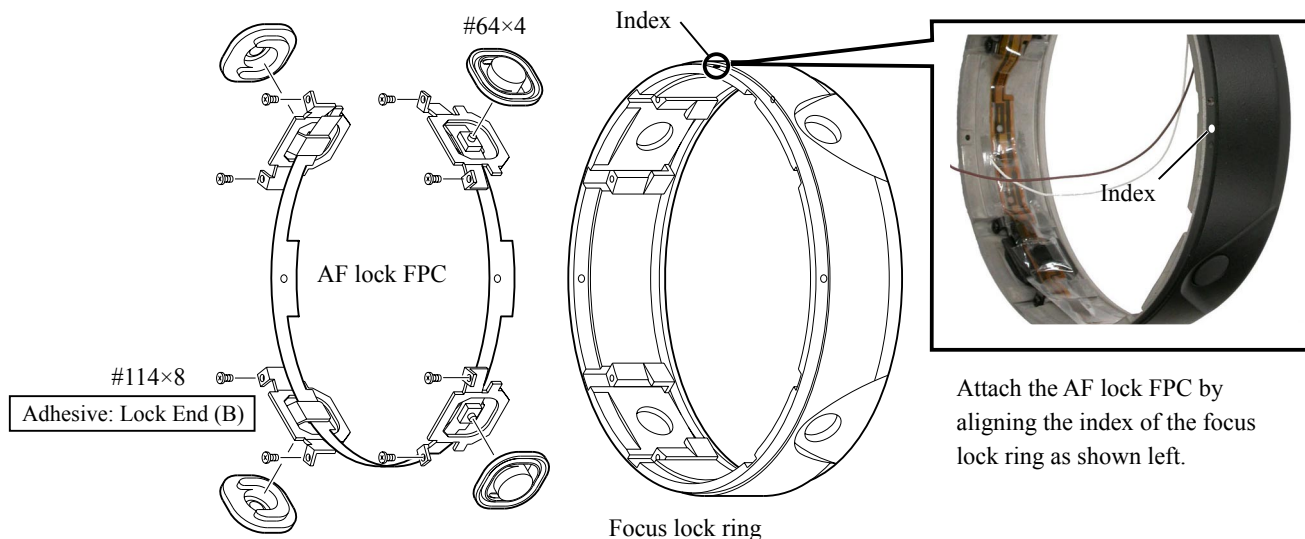
- Position adjustment of the distance encoder brush

- ① Turn the SWM connection plate to the full up position in the direction indicated by the arrow. (ref. Fig. 1)
- ② Adjust the position of the brush so that the distance between reference position as shown in the left "o" and the contact surface of the brush becomes 5 mm. Then fix with 2 screws (#72).
- ③ After the adjustment, fix the screw (#72) with the Screw Lock.

Attach Gold ring



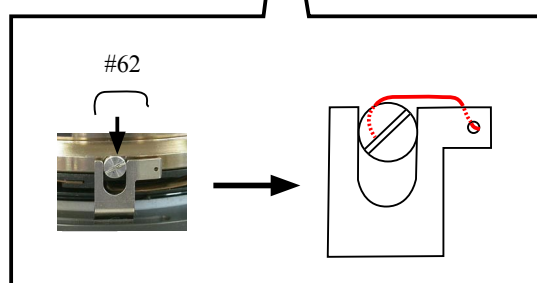
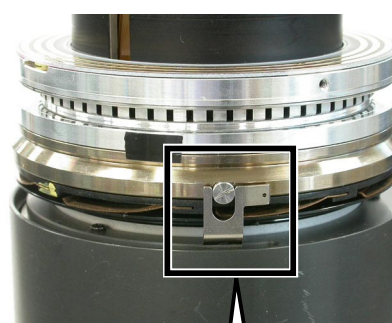
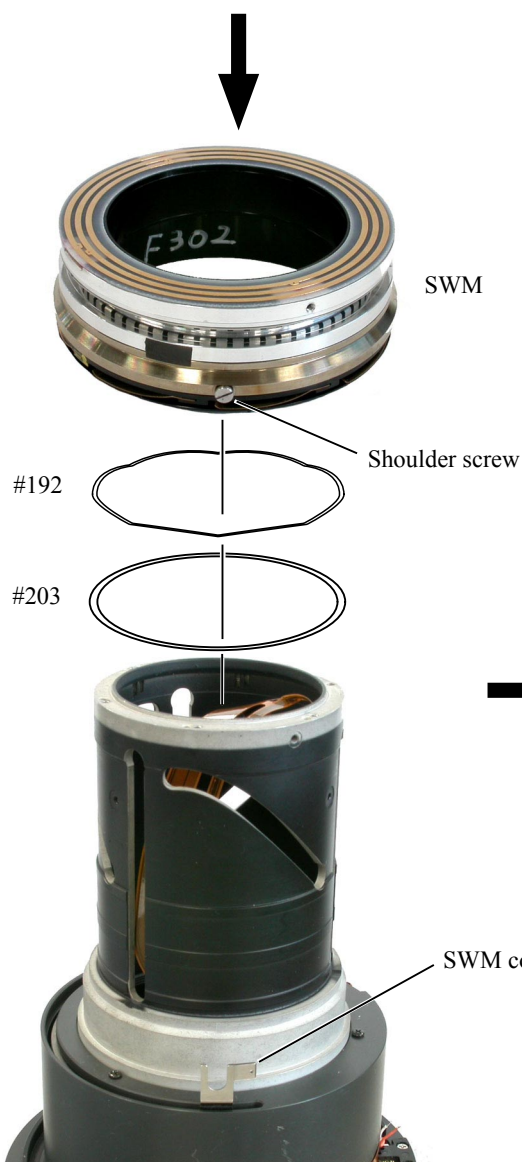
Focus lock ring



SWM unit



- When the SWM is attached, store the FPC in the body by passing it through the cam groove so that the FPC is not damaged.
- Attach the MF ring.



- Align the shoulder screw of the SWM with the SWM connecting-plate to assemble the SWM.
- Hook the spring (#62) to the shoulder screw of the SWM and the SWM connecting-plate. (ref. above Fig.)

Distance scale seal

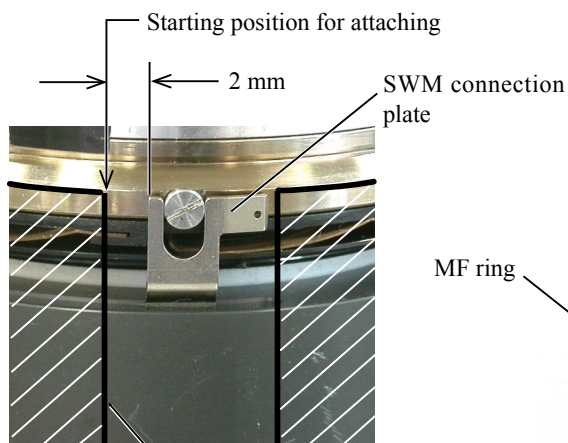


Fig. 1

Distance scale seal

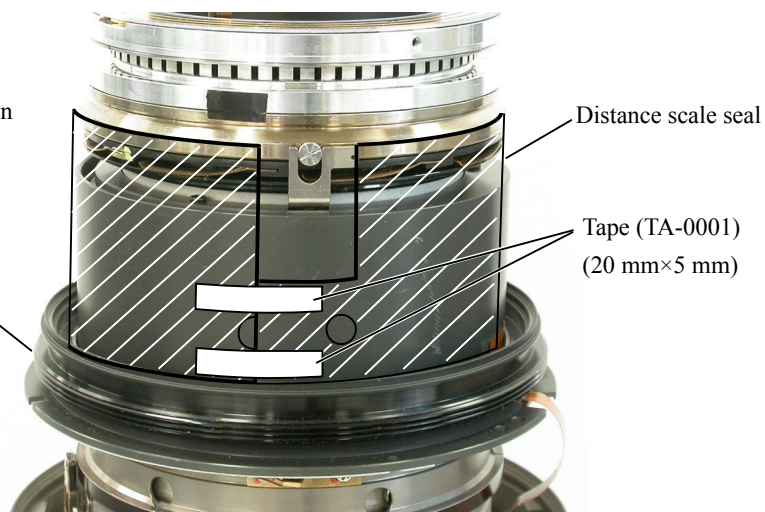


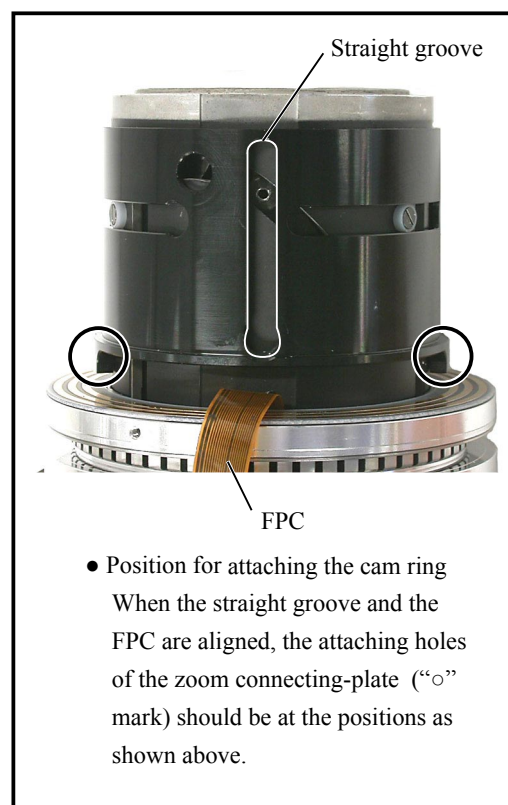
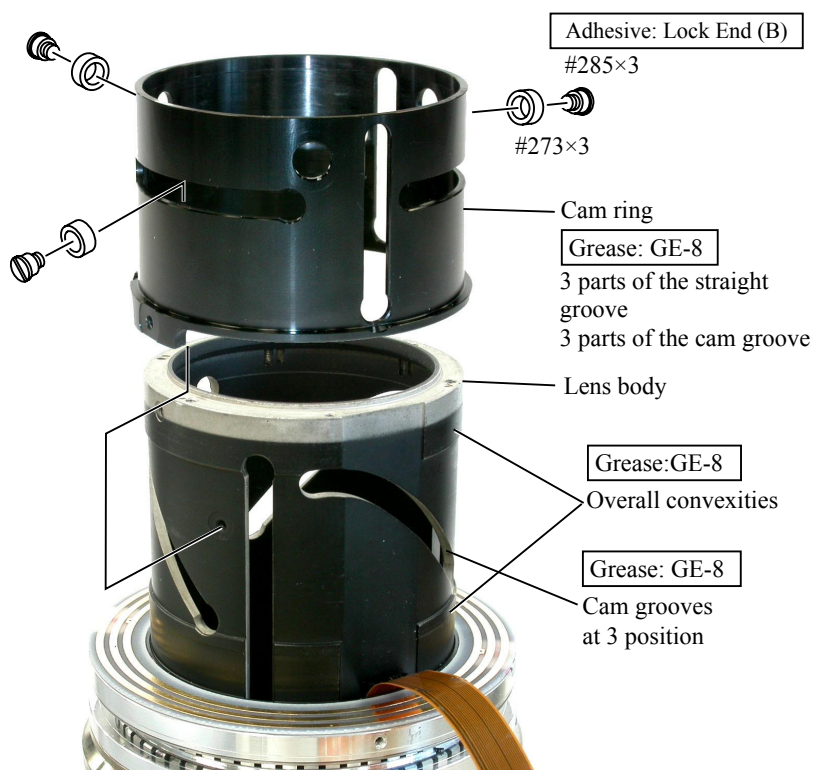
Fig. 2

Note: If B79 is put in after attaching the distance scale seal, it may cause damages to the distance scale seal, so be sure to put the MF ring first.

- Attach the distance scale seal at a location 2-mm left from the edge line of the SWM connection plate. (ref. Fig.1)
- When attaching the seal is completed, cut the tape (TA-0001) into pieces (20-mm×5-mm), and attach them at the seal end to finish. (ref. Fig. 2)

Cam ring

Note : Before putting the cam ring, be sure to pull out the FPC that was stored in the body.



- Position for attaching the cam ring
When the straight groove and the FPC are aligned, the attaching holes of the zoom connecting-plate (“o” mark) should be at the positions as shown above.

Overall convexities
3 positions of the cam groove

Grease: MZ-800S

#259

Convexities

#134×3
#133×3
#143×3

Adhesive: Lock End (B)

4th sliding ring

Overall outer
side of the ring

Grease: MZ-800S

4th sliding ring

Direction of the 4th sliding ring for attachment

Lens front

Lens back

#134×3
#133×3
#143×3

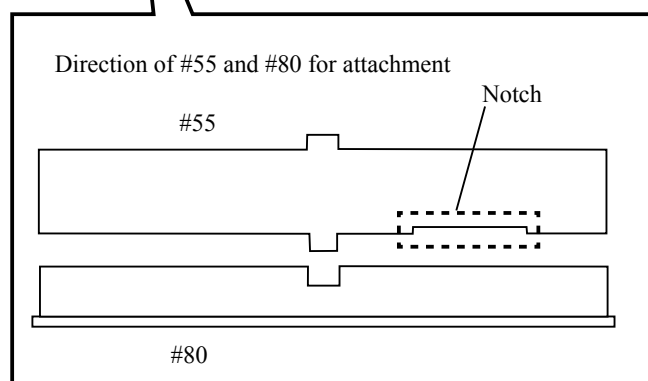
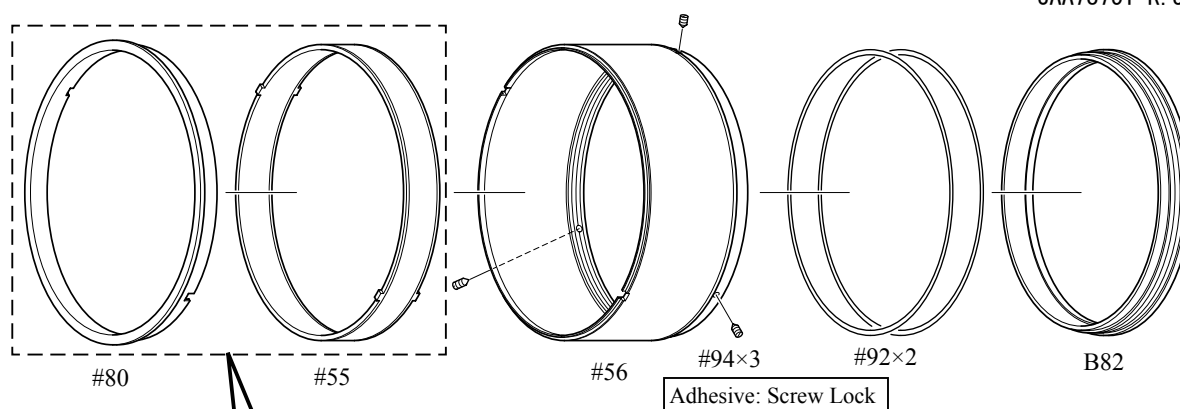
Adhesive: Lock End (B)

Distance scale window unit

B34

• Check the thickness of the washer (B34)(4 mm). Make a correction by bending it if necessary.

4 mm



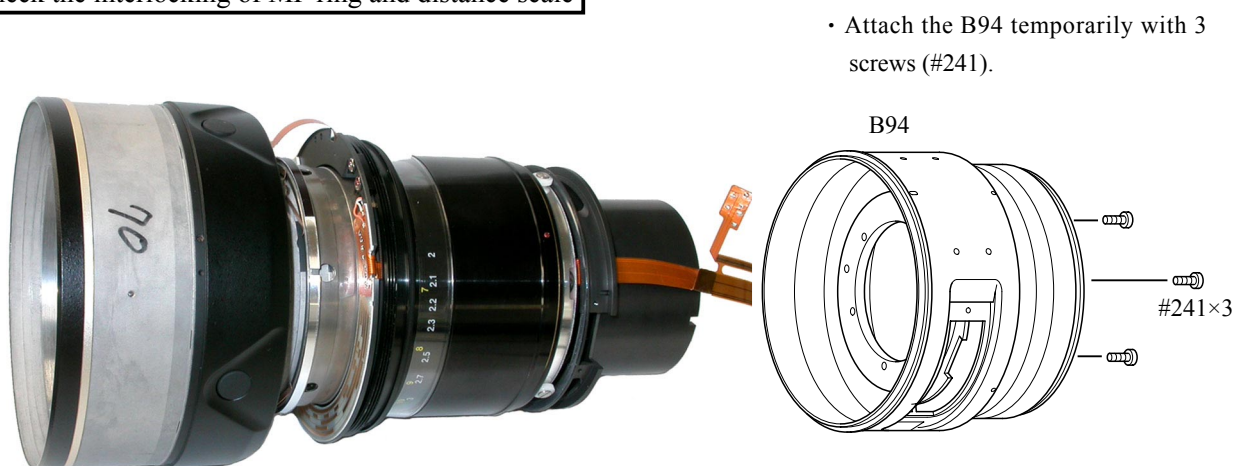
- Assemble the assembled distance scale window unit into the lens body.



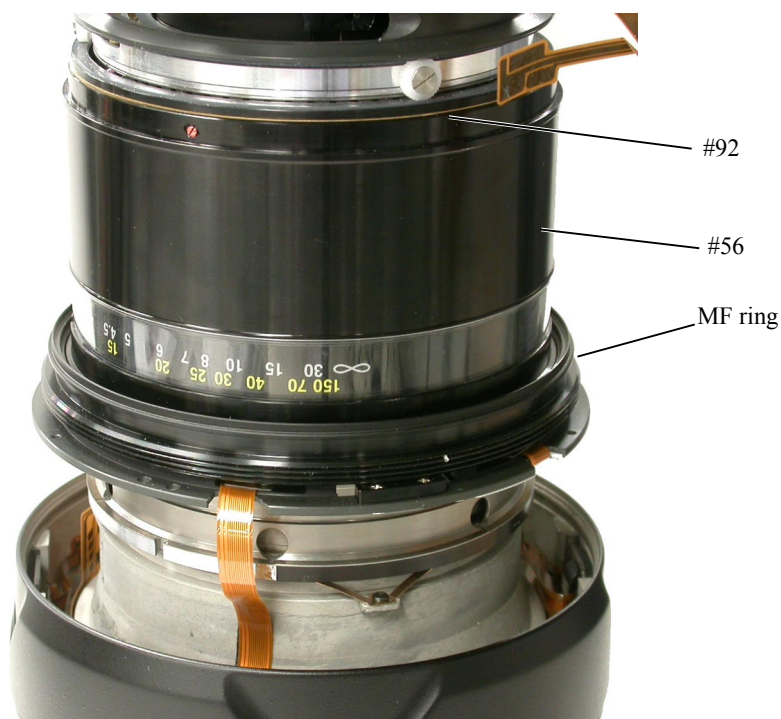


- While holding #56 downwards, attach 3 screws (#104) and 3 rollers (#108).
- Pass the FPC through the groove of B84, then attach the B84.
- Attach the screw (#330).

Check the interlocking of MF ring and distance scale

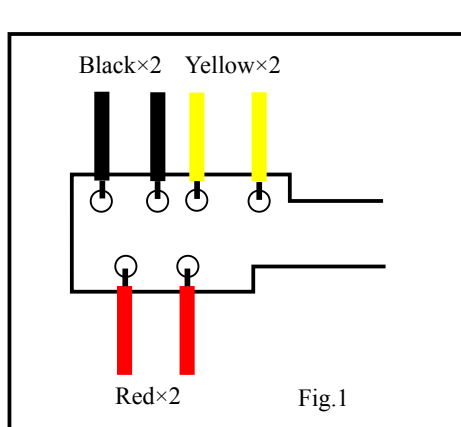


- Attach the B94 temporarily with 3 screws (#241).

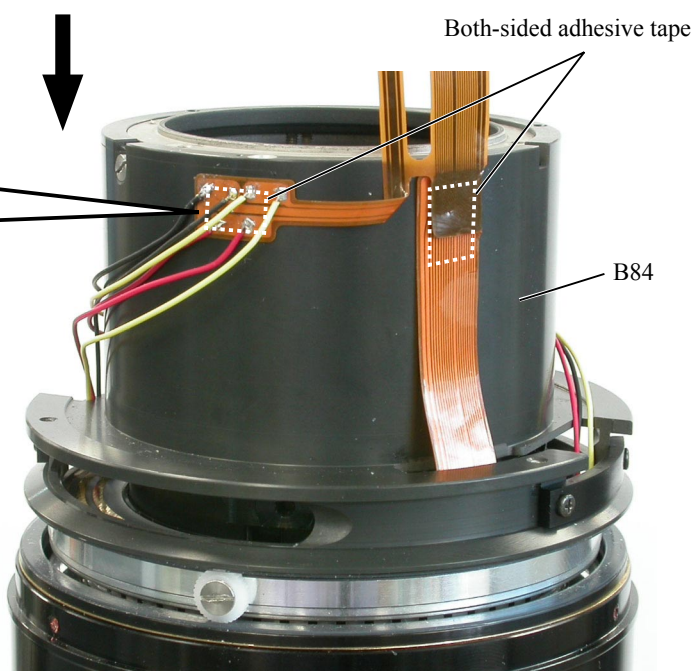


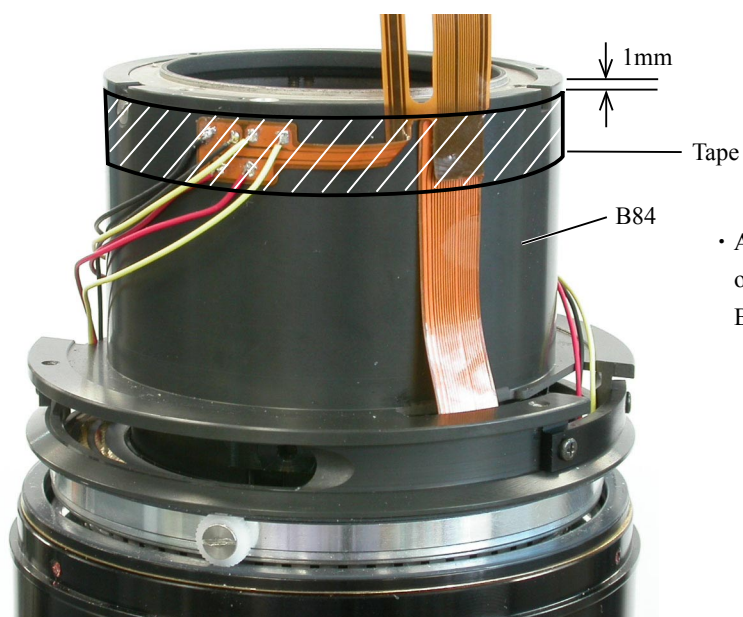
- Check the interlocking of #56 by rotating the MF ring.
If the following phenomenon is found, adjust it by changing the thickness of the washer (#92). Refer to Page L34 for details.
 - When the MF ring is rotated, #56 does not turn following the rotation.
Adjustment: Thicken the washer (#92).
 - When the MR ring is rotated exceeding the rotation limit, the SWM turns.
Adjustment: Thin the washer (#92).
- If the interlocking works normally, remove the B94 that was temporarily attached.

Power-brush



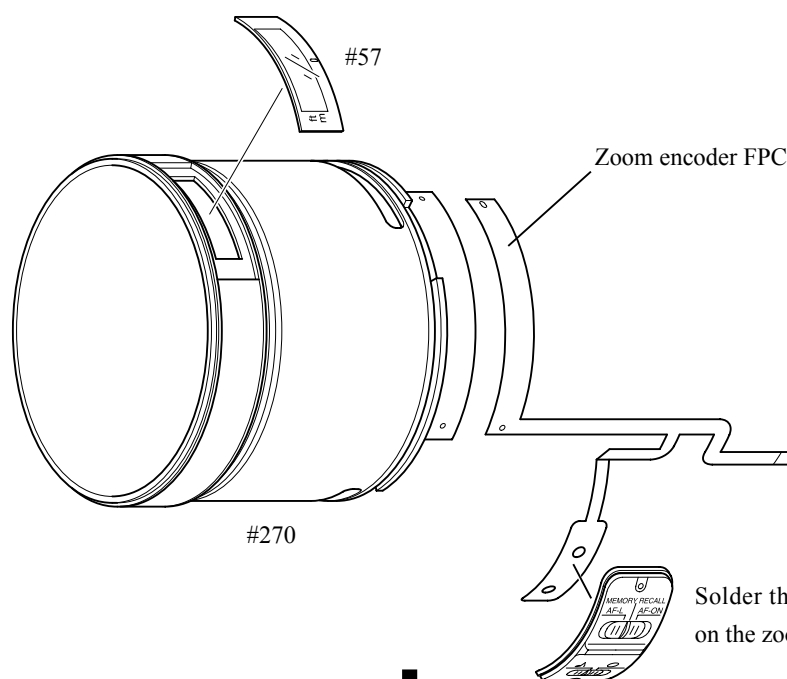
- Attach the FPC on B84 with the both-sided adhesive tape (at 2 parts).
- Solder the 6 wires of the power-brush on the FPC. (ref. Fig.1)



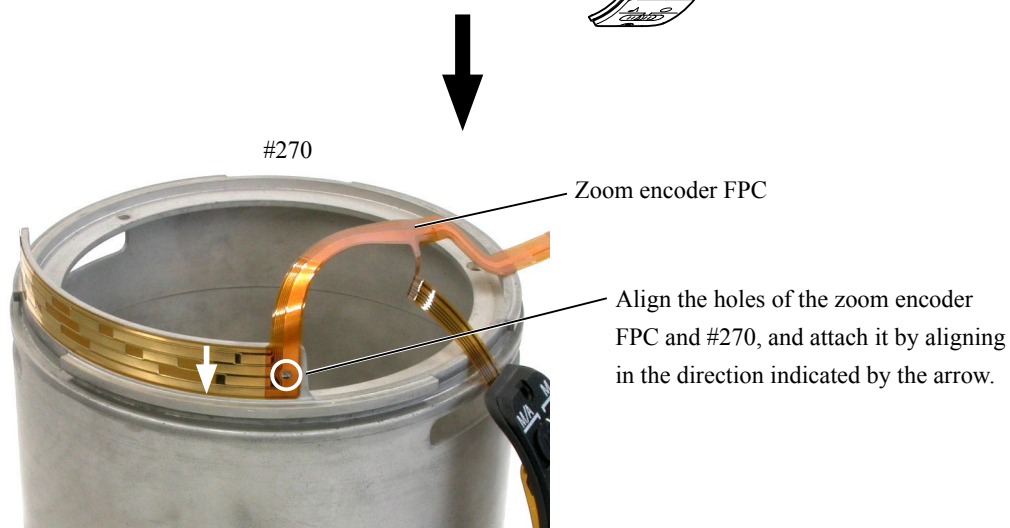


- Attach the tape (TA-0001) around the outer side of B84, at a location 1-mm below the rim line of B84 as shown.

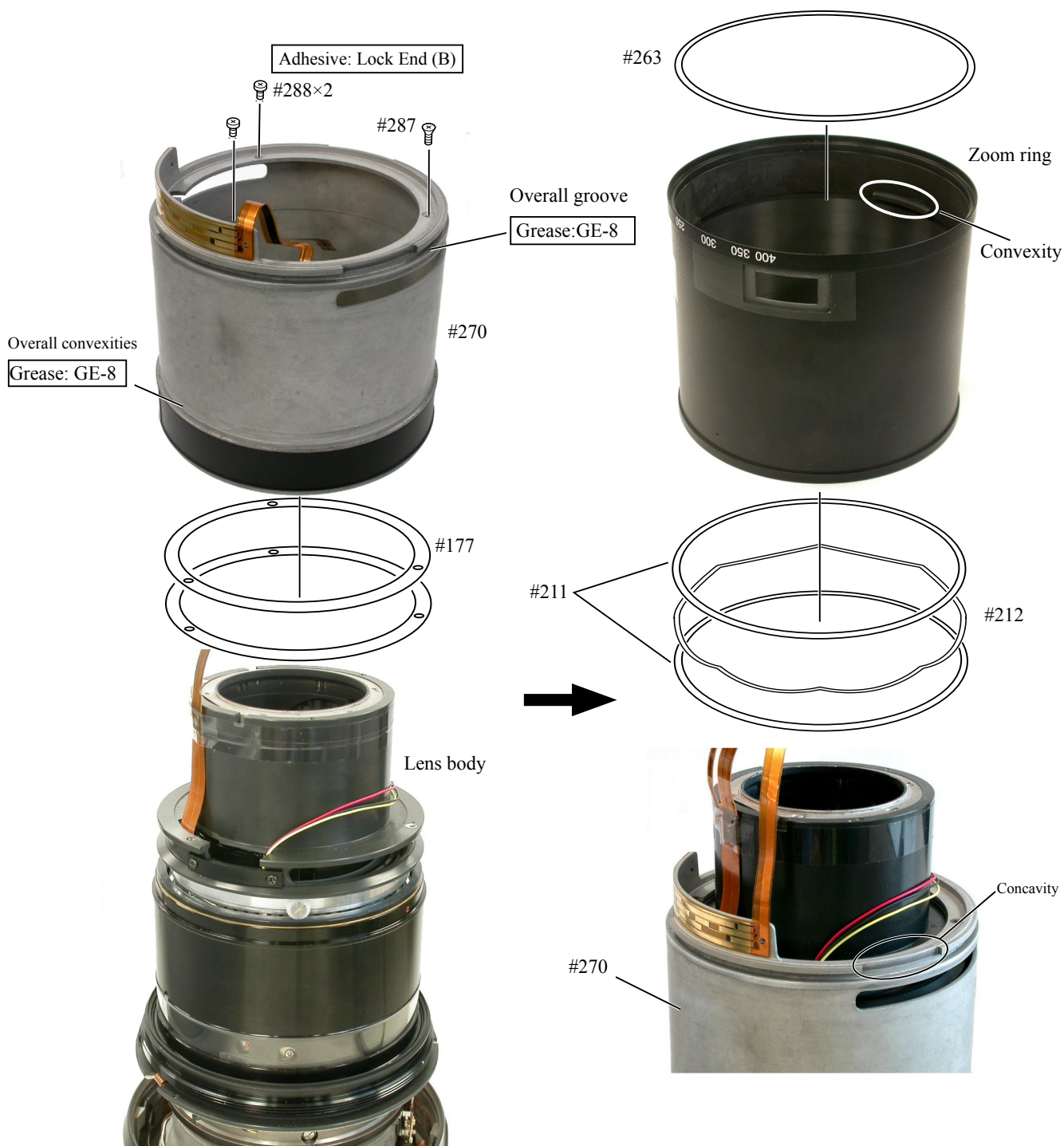
Zoom encoder FPC



Solder the change-switch unit on the zoom encoder FPC.



Zoom ring



- Assemble #270 into the lens body, and fix them with the screw (#287) and 2 screws (#288).

Note: Do NOT apply the adhesive on the screw (#287) (for earthing/grounding).

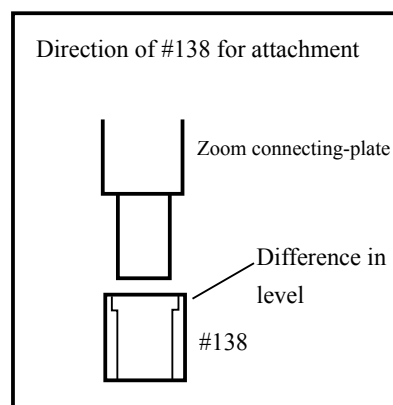
- Put 2 washers (#211) and 1 washer (#212) on #270.

In this case, put #212(wave washer) between the 2 washers (#211).

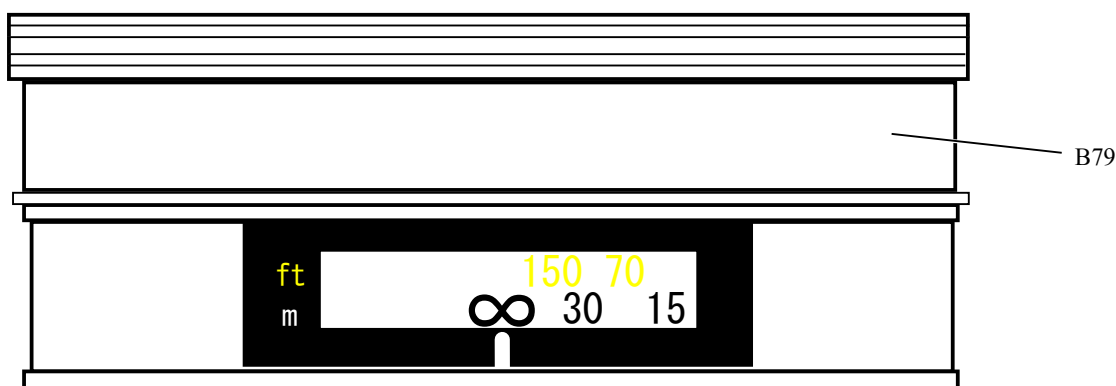
- Align 3 convexities of the zoom ring with 3 concavities of #270, and assemble them.



- Attach the zoom connecting-plate (#266) and #138.

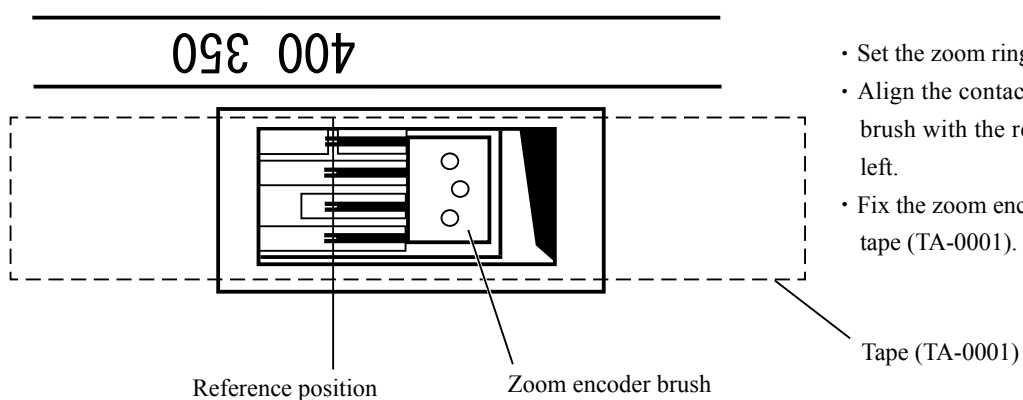


Position-check on Distance encoder brush



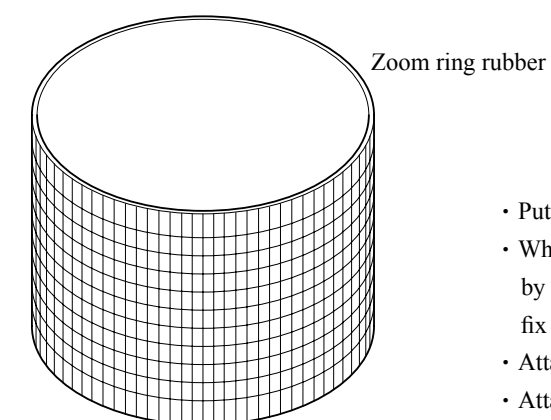
- By turning B79, set the distance scale to "∞".
- Check if the distance encoder brush is put in the reference position. (ref. Page L29)
- If there is misalignment, realign it by referring to Page L29.

Zoom encoder brush

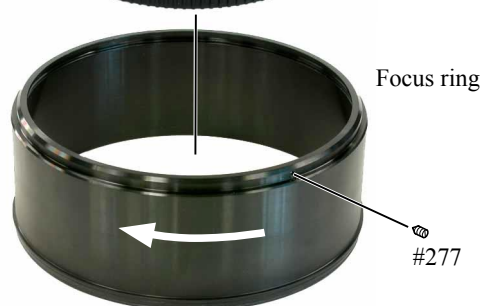
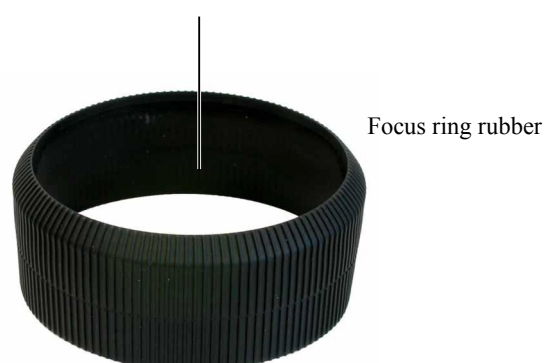


- Set the zoom ring to WIDE side.
- Align the contact face of the zoom encoder brush with the reference position as shown left.
- Fix the zoom encoder brush by attaching the tape (TA-0001).

Focus ring, Focus ring rubber, Zoom ring rubber



- Put the focus ring in position.
- While holding the MF ring, place the focus ring by turning it in the direction of the arrow, then fix it with the screw (#277).
- Attach the focus ring rubber.
- Attach the zoom ring rubber.



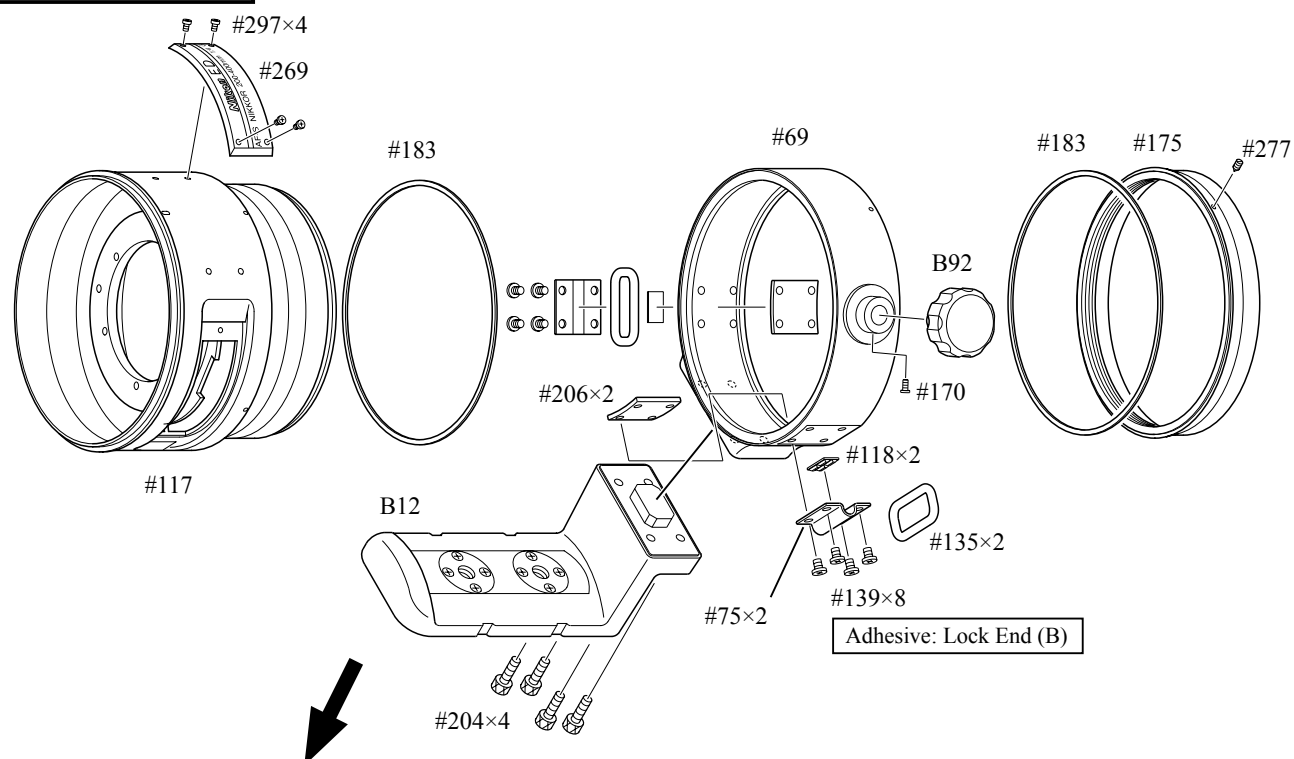
5th lens group



5th lens group
(Use J11300)

- Set the zoom ring to TELE side.
- Attach the 5th lens group.

Tripod ring unit



Tripod ring unit

Zoom encoder FPC

Change-switch unit

Fig. 1

Zoom encoder FPC

Relay FPC

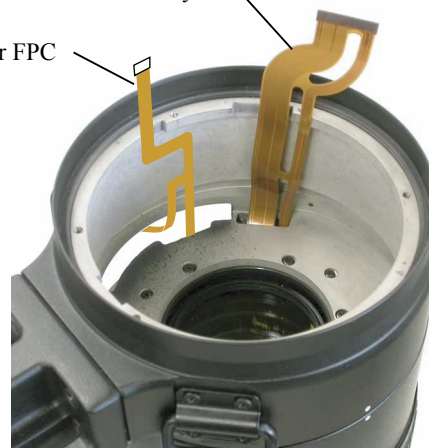
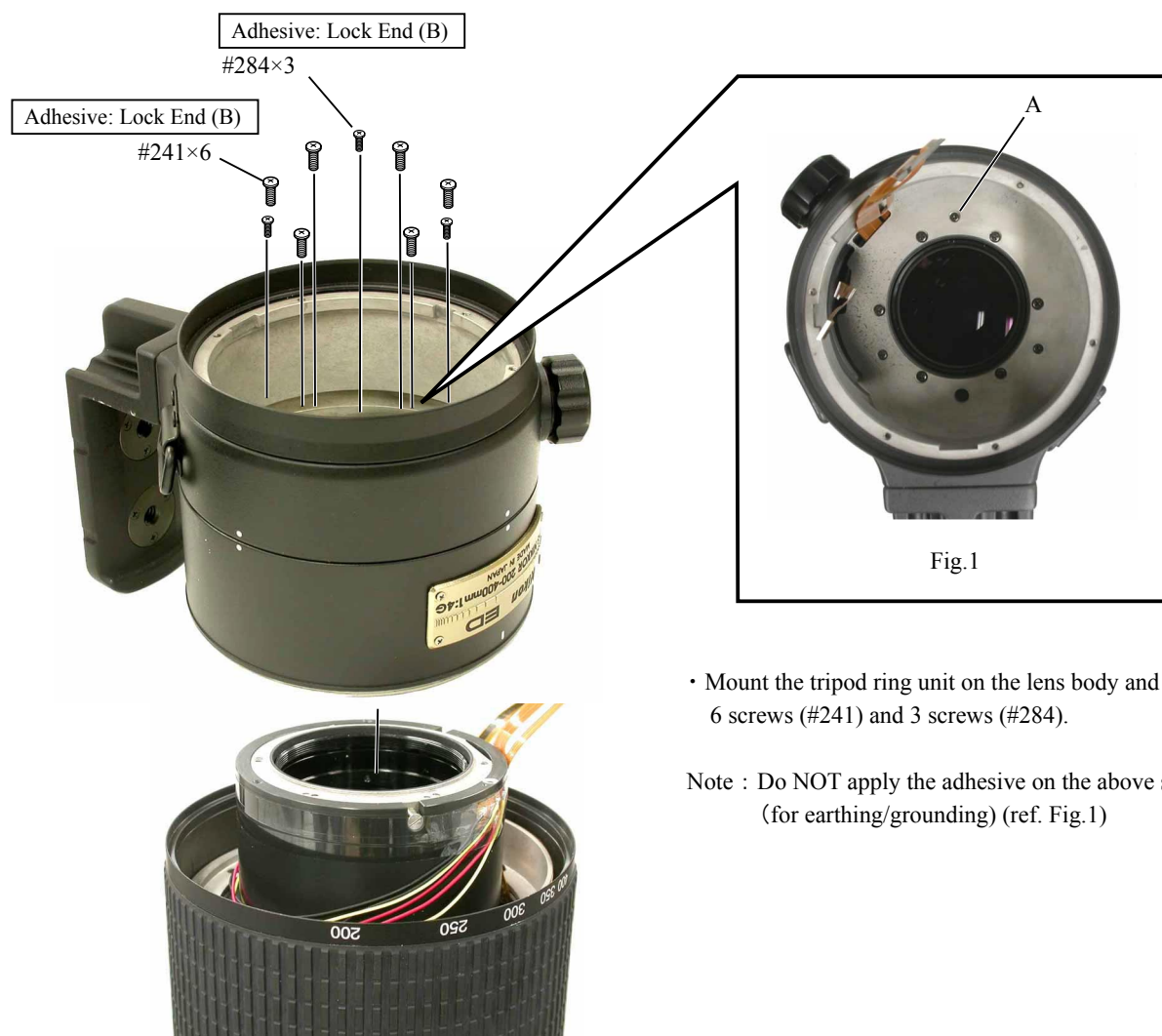
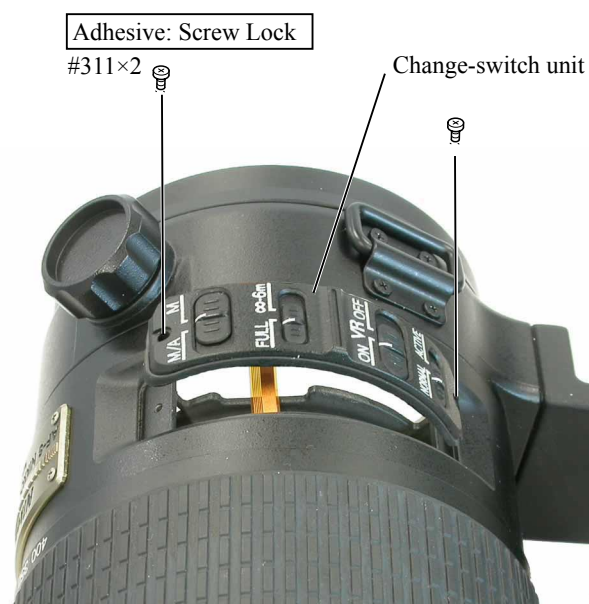


Fig. 2

- Pass the change-switch unit through the switch attaching hole of the tripod ring unit. (ref. Fig. 1)
- Pass the zoom encoder FPC and relay FPC through the hole of the tripod ring unit. (ref. Fig. 2)

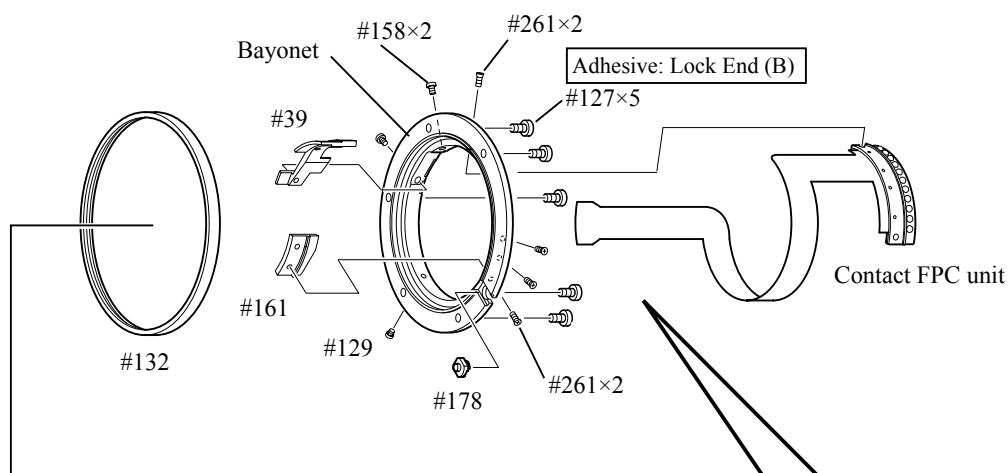


Change-switch unit



Note: Do NOT attach the screw (#311) too tightly
because the change-switch may be damaged.

Bayonet, Fix-tube

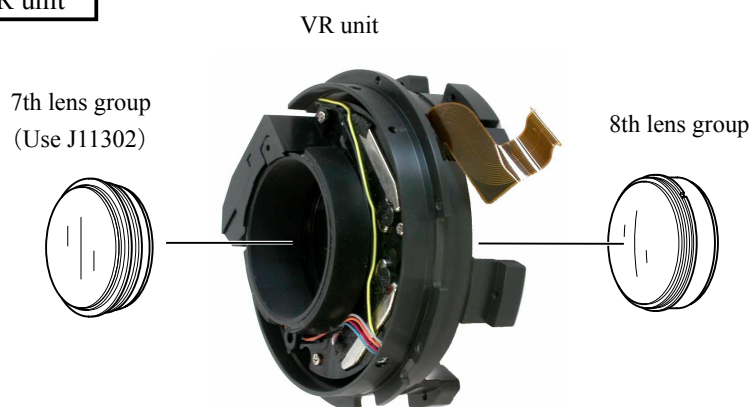


Note : Do NOT apply the adhesive on the below screw (A).
(for earthing/grounding)



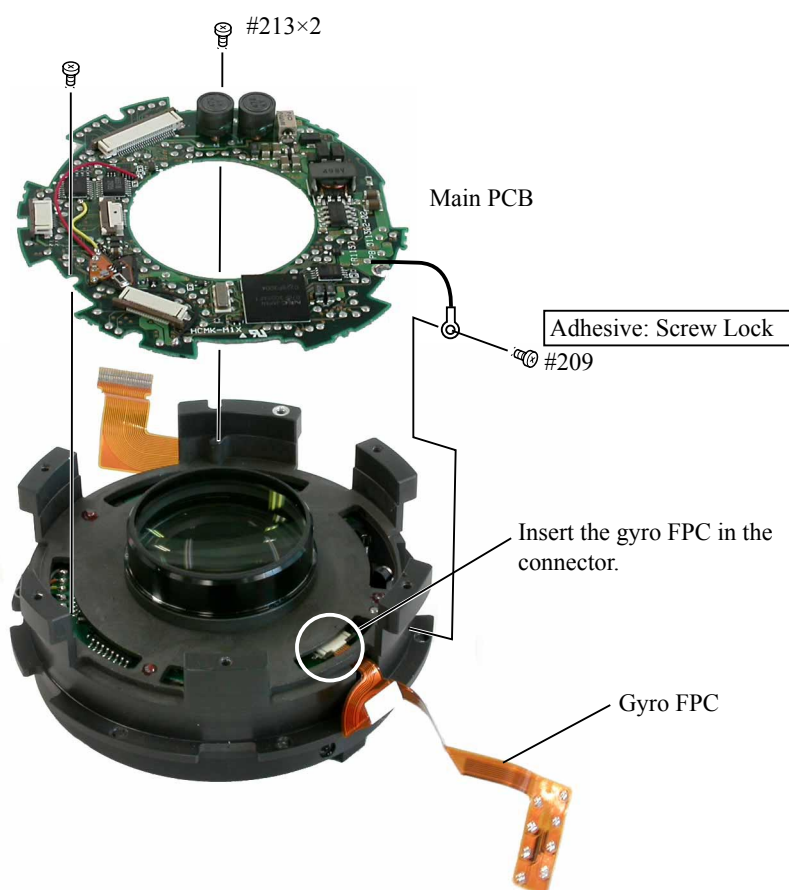
- Attach the light-shielding seal (#216) at the position as shown right.
(ref. Fig.1)

VR unit

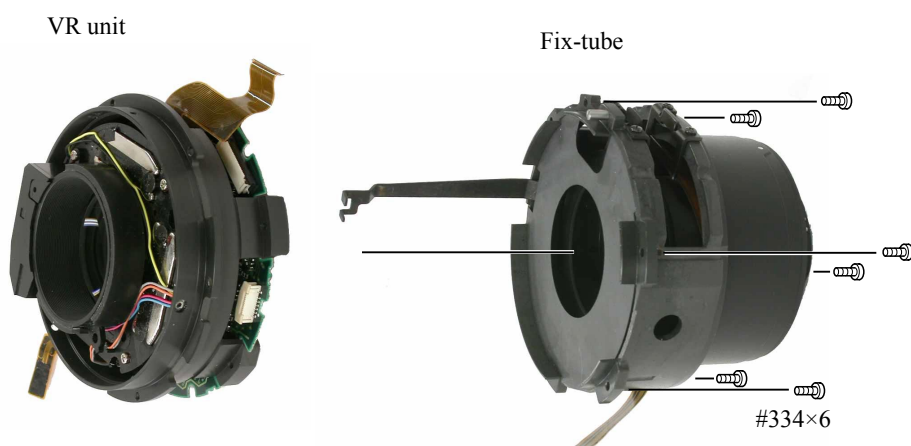


- The inclination adjustment is already made for the assemblies of the VR unit, so when the VR unit is replaced, it is not necessary to make an adjustment.

Main PCB



Assemble VR unit and Fix-tube



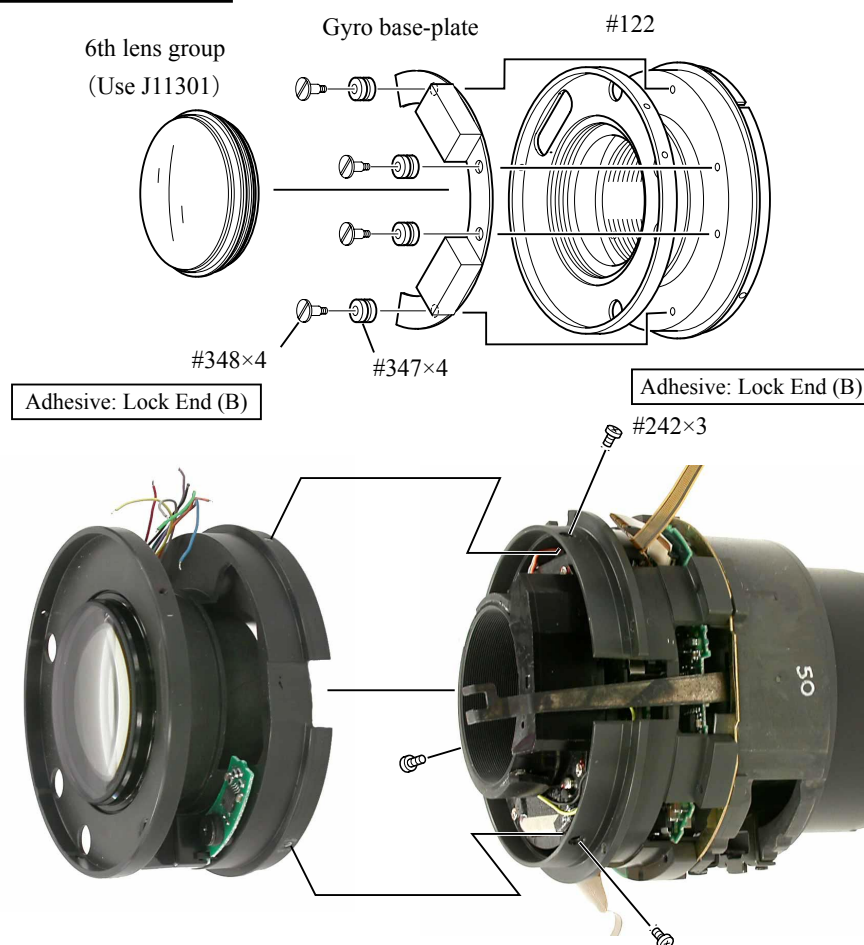
- Attach the VR unit and fix-tube temporarily with the screw (#334).



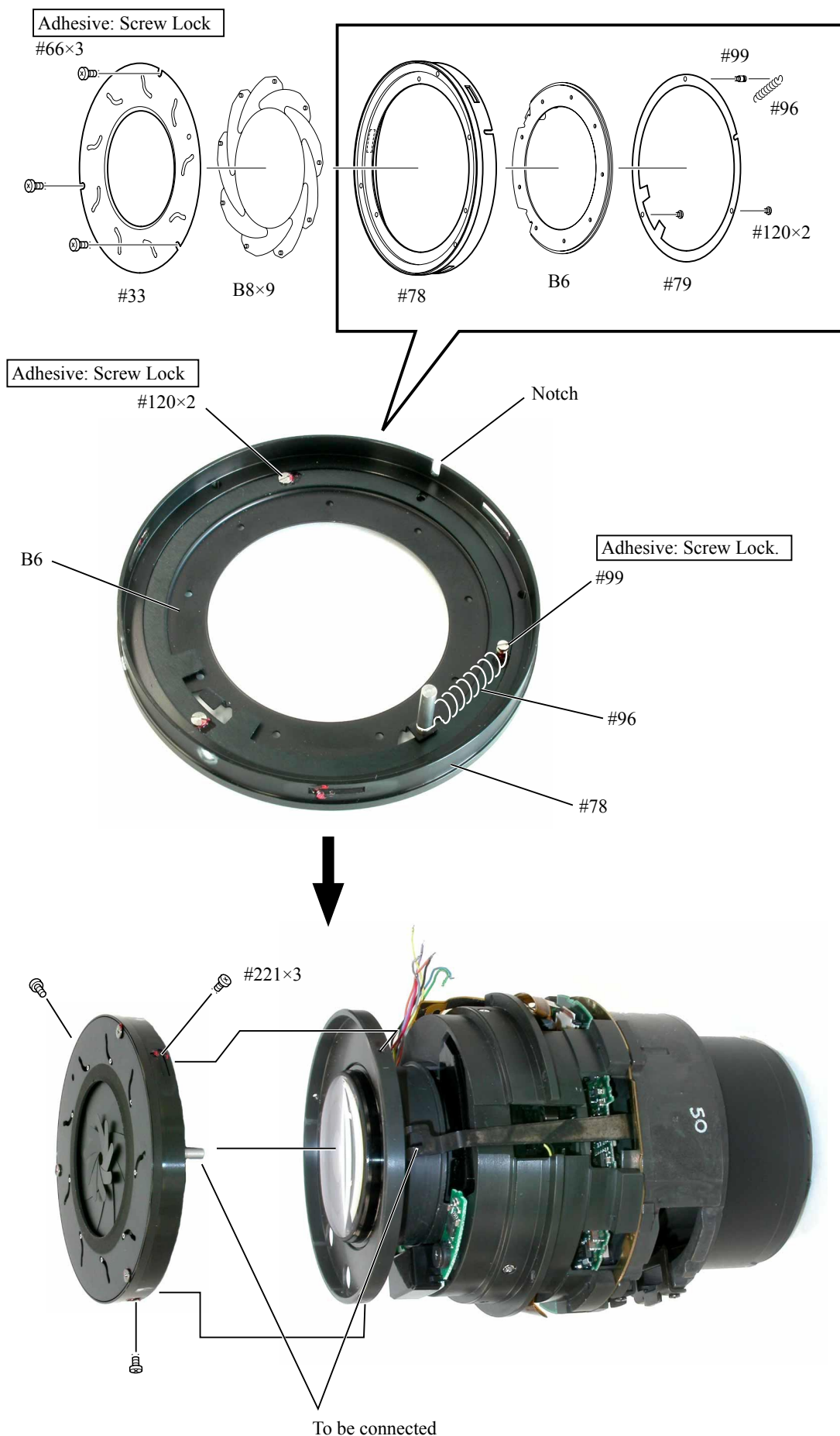
Insert the FPCs in the connectors.

- Insert the FPCs (at 2 parts) in the connectors.
- Put the F. F. D adjustment washer (#332) between the VR unit and fix-tube.
- Tighten 6 screws (#334). After the F.F.D adjustment is made, fix with Screw Lock.

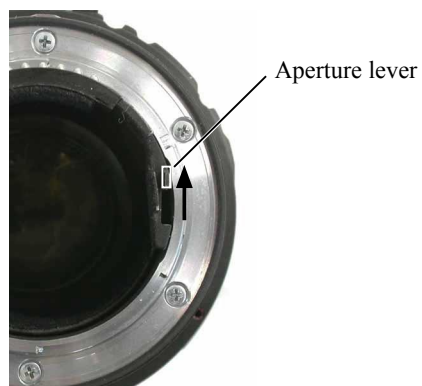
Gyro base-plate, 6th lens group



Aperture blade unit



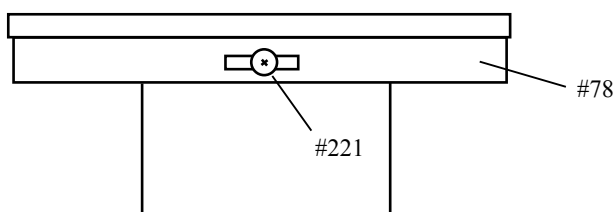
Aperture diameter adjustment



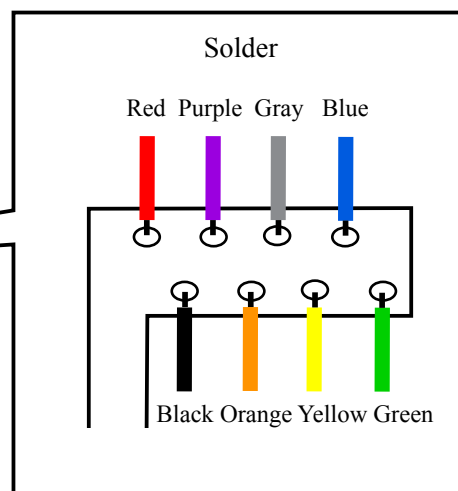
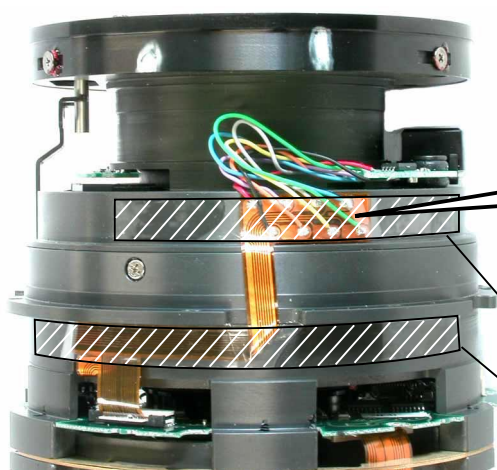
- Set the aperture lever to the full aperture side.
- Loosen the screw (#221), and by turning #78, make an adjustment of the aperture diameter.

Standard: Full aperture

- After the adjustment, fix the screw (#221) with the Screw Lock.

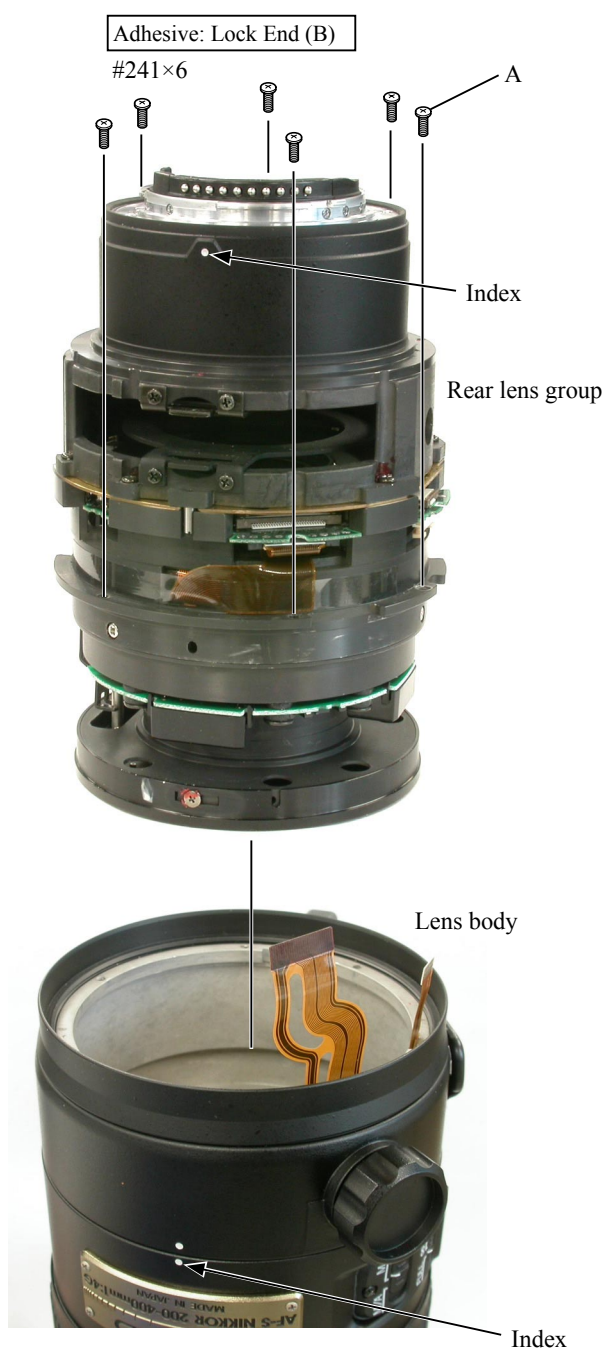
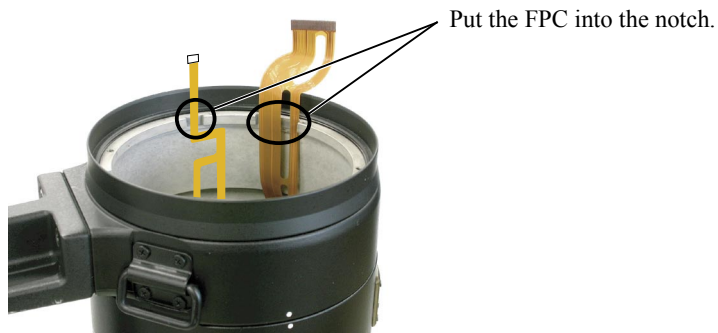


FPC arrangement, Soldering



Fix the FPC with the tape (TA-0012).

Assemble the Body and Rear group

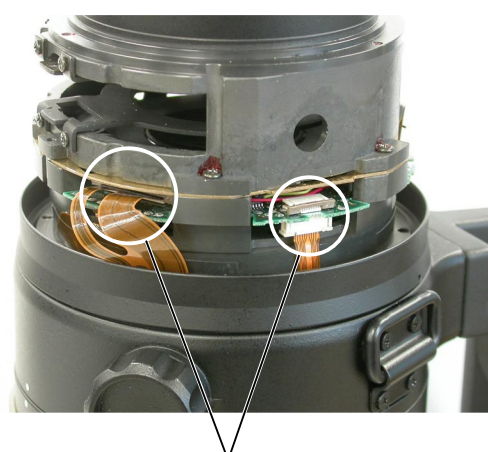


- Align the indexes of the rear lens group and the lens body, and assemble them.

- Fix them with 6 screws (#241).

Note : Do NOT apply the adhesive on the left screw (A).
(for earthing/grounding)

- Insert the FPC (at 2 parts) in the connector.



2nd, 3rd, 4th lens group

2nd lens group

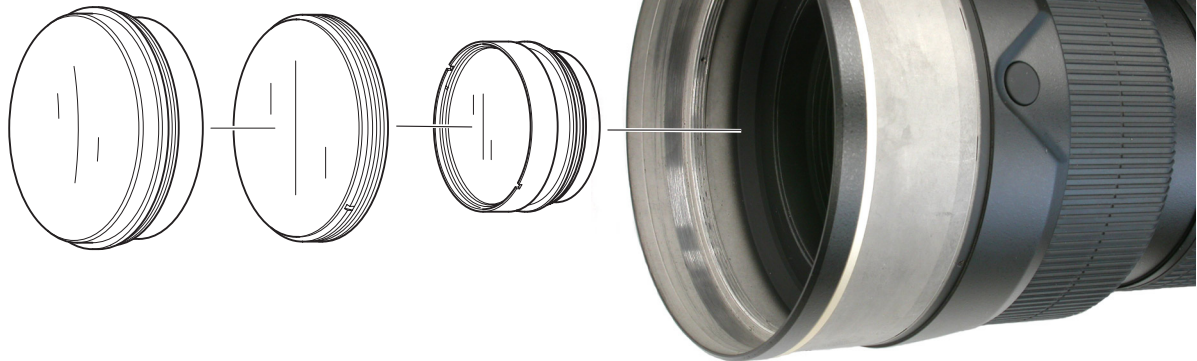
[Use the tool (J11297) for
assembly.]

3rd lens group

[Use J11298]

4th lens group

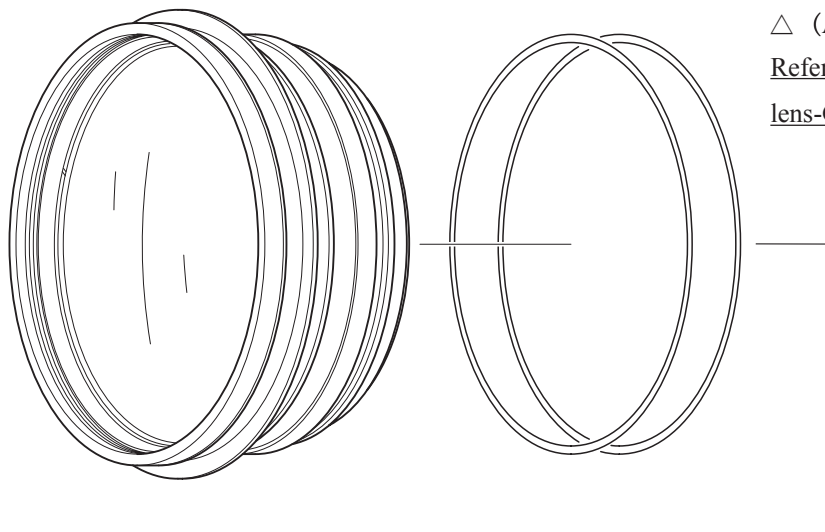
[Use J11299]



1st lens-G, Rubber ring

1st lens group

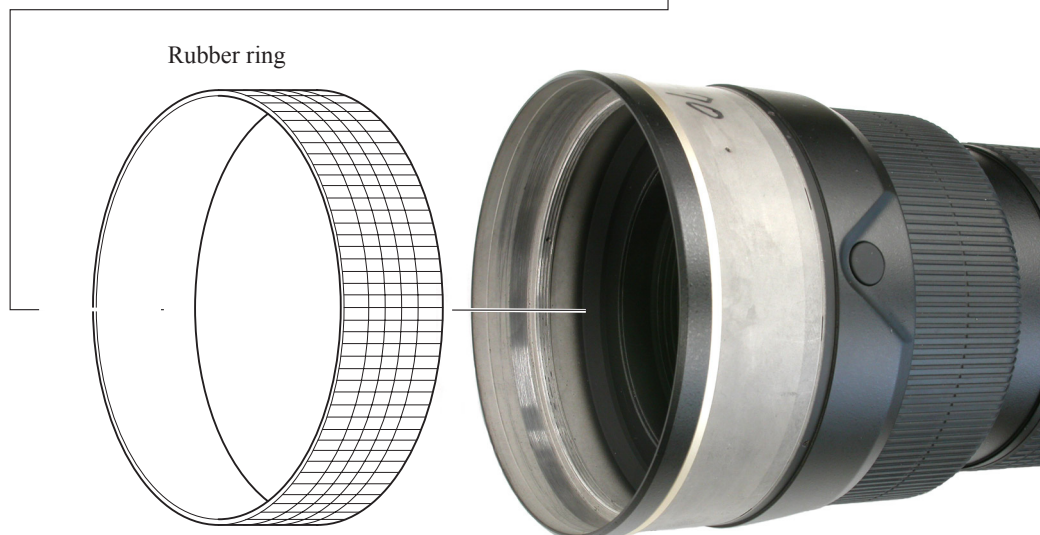
#342



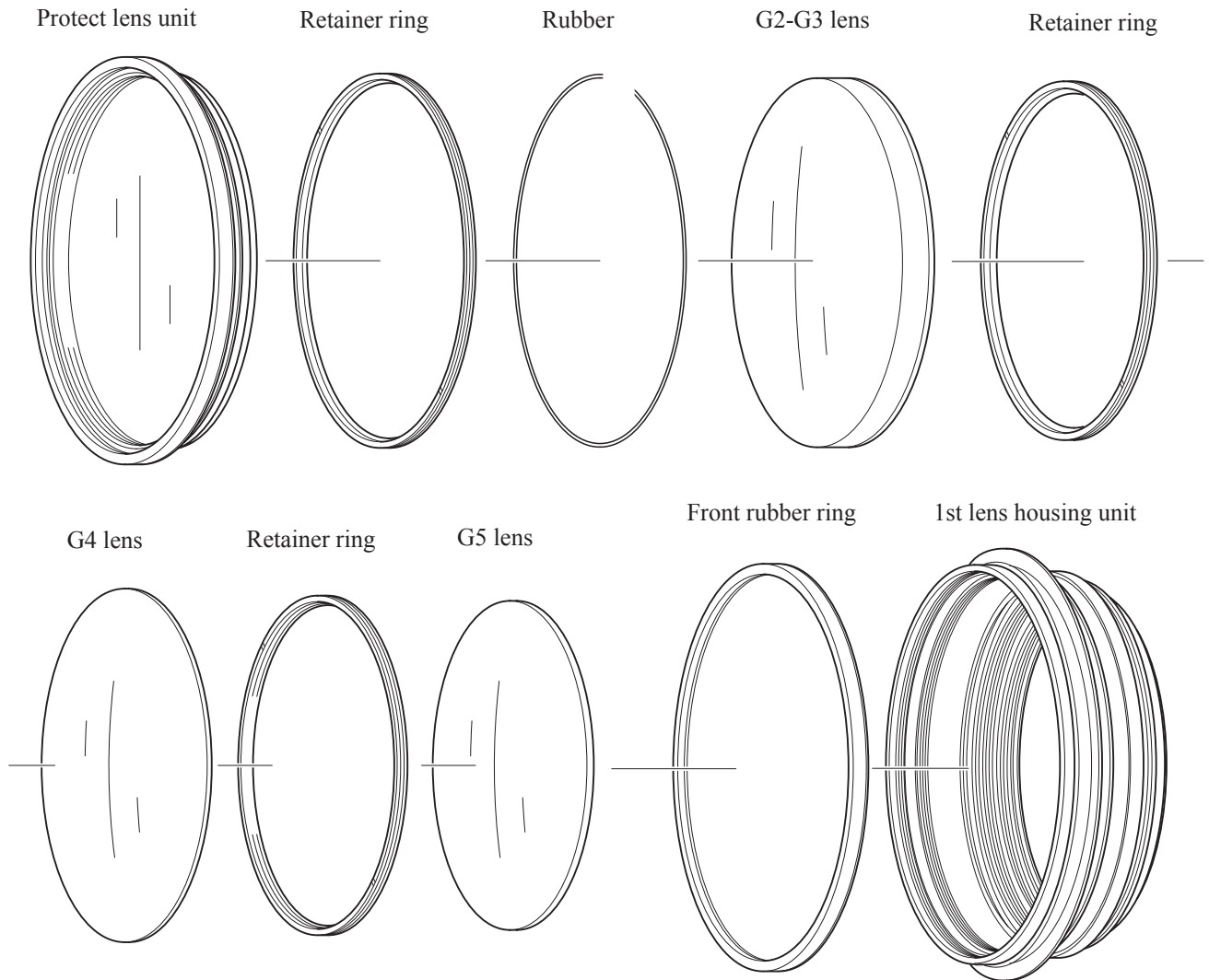
△ (Addition)

Refer to "L49-1" for assembling 1st
lens-G.

Rubber ring



1st lens group

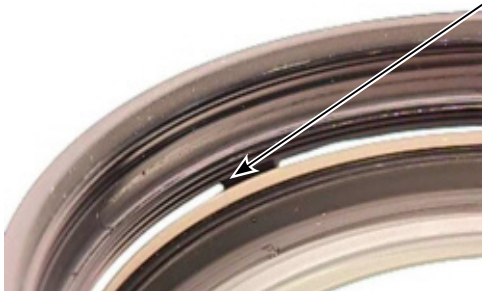


G2-G3 lens



After mounting the G2-G3 lens, attach the rubber to the rim by pushing it in the groove of the 1st lens housing unit with stickers, etc.

Rubber



After attaching the rubber, a slight gap will be left because of a shortage of length of the rubber. Being careful not to pinch the rubber, rotate the retainer ring and stabilize the G2-3 lens.

Adjustment (Division) of Focus movement (T, W)

1. Align the infinity (∞) mark of the focus ring with the index.
2. Fix the aperture lever so that the aperture becomes full.
3. Read each value of WIDE and TELE sides.
4. Calculate as follows:

$$(A - B) \div 5 = C$$

A = Value at TELE position

B = Value at WIDE position

C = Adjustment amount (mm) of the washer (#342) of the 1st lens group

5. Adjust the washer (#342) by increasing/decreasing by the above value of C. If C is plus, increase the thickness of it, while it is minus, decrease the thickness of it.

Note : When the washer (#342) is put, place a thin washer between thick washers

Adjustment of F.F.D (Back focus)

1. Align the infinity (∞) mark of the focus ring with the index.
2. Fix the aperture lever so that the aperture becomes full.
3. Read the value of Wide or Tele side.
4. Loosen 6 screws (#334). (ref. Page L45)
5. Adjust the washer #332 by increasing/decreasing by the difference from the standard value. If the difference is plus, increase the thickness of it, while it is minus, decrease the thickness of it. (ref. Page L49)

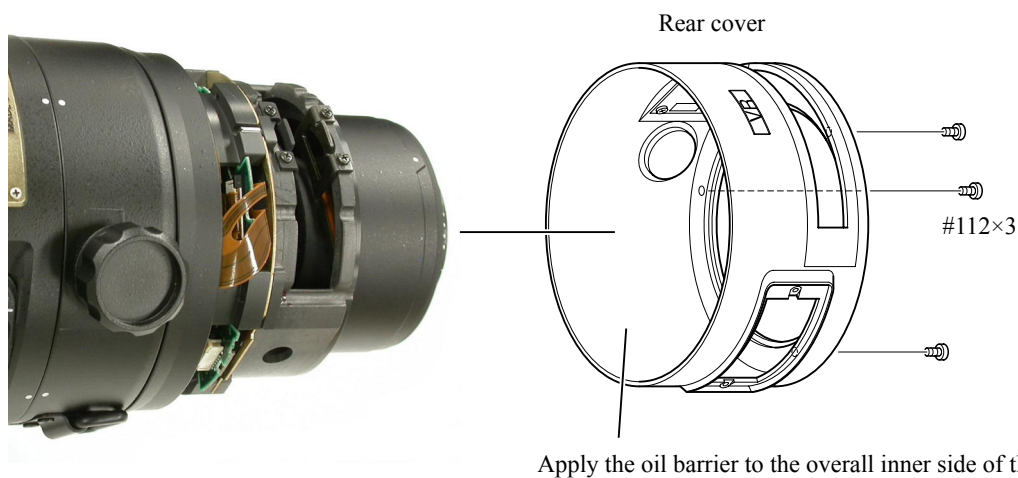
Note : When the washer (#332) is adjusted, be sure to increase/decrease the thickness evenly on either side.

Focal length (f)	Standard (mm)
200 mm	- 0.05 ~ + 0.10
300 mm	- 0.06 ~ + 0.15
400 mm	- 0.10 ~ + 0.20
Difference btwn T- and W- sides	0.1 or less

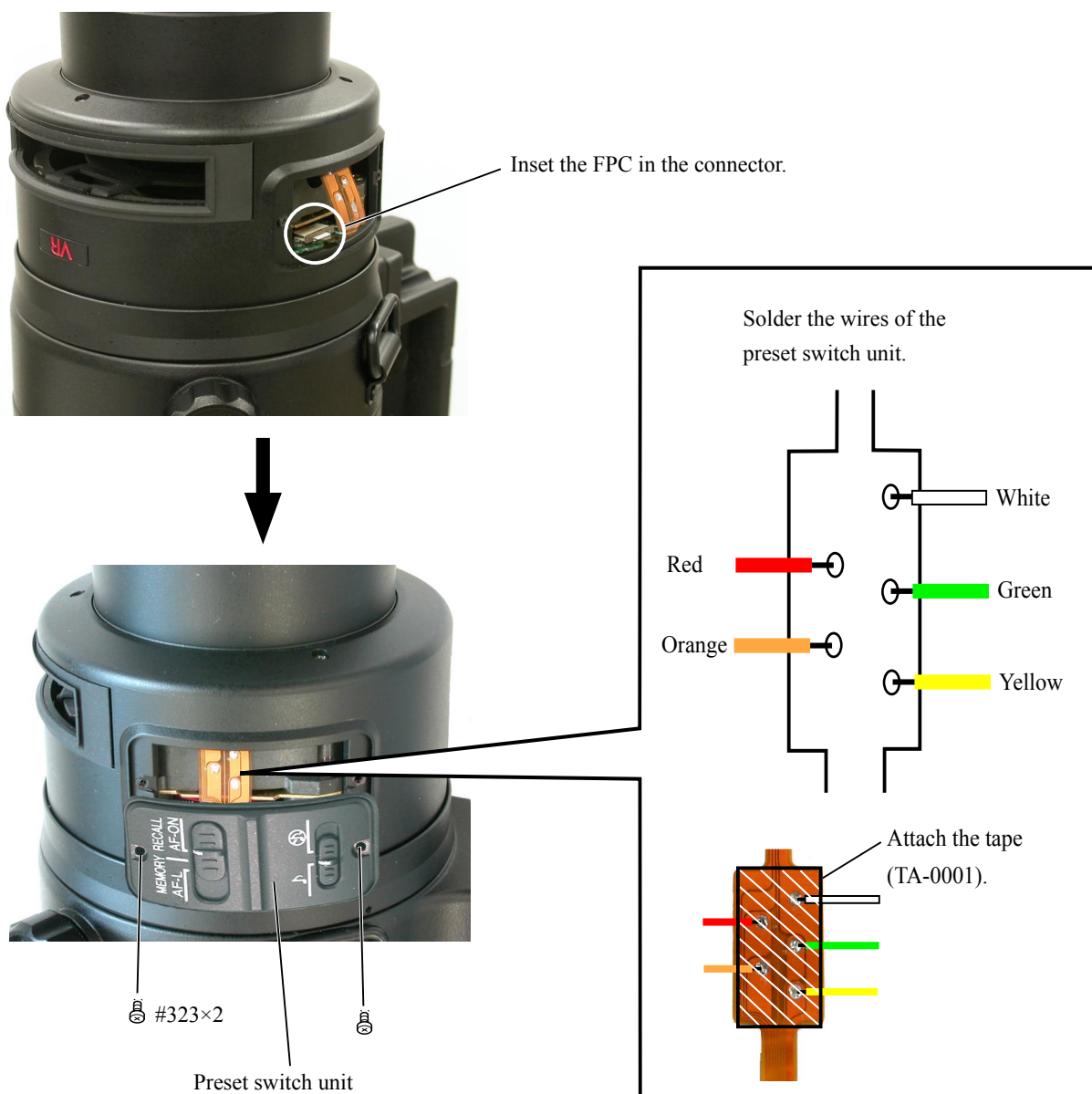


- After the F.F.D (back focus) adjustment, fold the rubber in half so that the screw holes can be seen. Then attach 3 screws (#277).
- Put the rubber ring back in position.

Rear cover



Preset Switch unit



PREPARATION FOR INSPECTION / ADJUSTMENT OF MAIN PCB

- In case of replacing the main PCB, SWM unit or MR encoder unit, be sure to make the necessary adjustments as follows:

1. Adjustments

- Adjust the MR duty
- Adjust the driving frequency and motor control

2. Equipment and tools to be required

- Single output rated voltage power supply: 1 unit (6.0V 3.0A)
- Oscilloscope: 1 unit For adjusting the MR duty, the driving frequency and motor control,
△ (Addition) Inspection of lens Driving Time
- AF-I communication box (J15306-1): 1 unit
- AF-I communication adapter (J15307): 1 unit

△ (Addition)

- In case of replacing the main PCB, be sure to perform [8.Writing of EEP-ROM Fixed Values]

△ (Addition)

AF-S ZOOM200-400 VR inspection and adjustment program (J18359)

The below hardware requirements are necessary for installing the program on a computer.

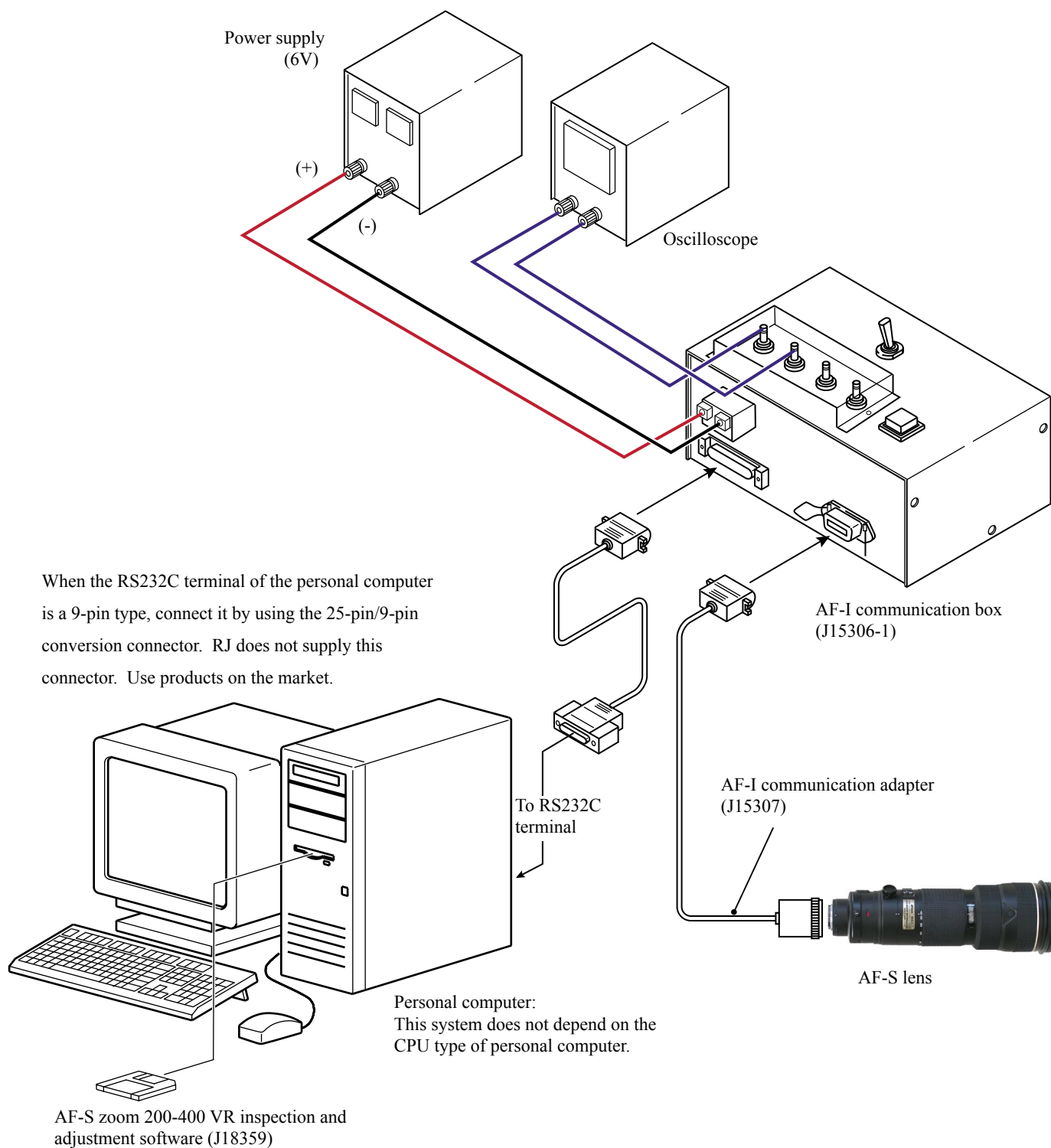
Ensure them before installation.

<u>PC</u>	<u>IBM PC/AT compatible</u>
<u>OS</u>	<u>Windows XP Home Edition, Windows XP Professional, Windows 2000</u>
<u>CPU</u>	<u>Pentium II 266MHz ~ Pentium IV 2GHz</u>
<u>RAM (Memory)</u>	<u>32MB or more</u>
<u>HD</u>	<u>6 MB-or-more free space is necessary when installation</u>
<u>Monitor resolution</u>	<u>800×600 or more pixels</u>
<u>Interface</u>	<u>Serial interface</u> <u>※ USB interface cannot be used.</u>

As long as the above requirements are met, either desktop or notebook PC is available.



【System configuration】

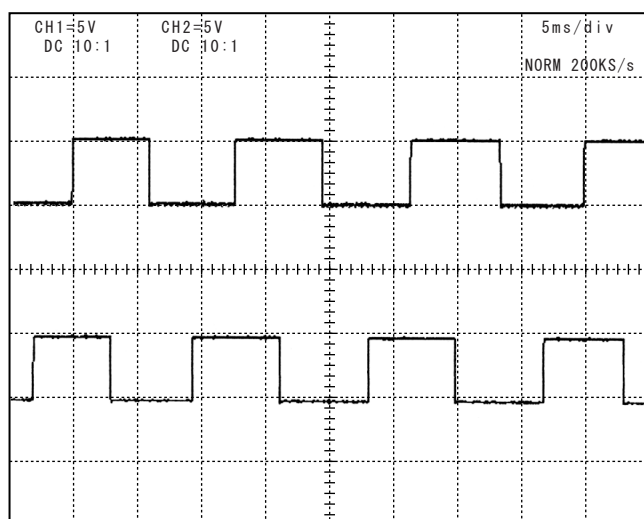


ADJUSTMENT OF MR DUTY

- In case of replacing the main PCB, SWM unit and MR encoder unit, be sure to make adjustments.
- In case of replacing the main PCB, be sure to perform ~~[3.READING AND REWRITING OF EEPROM-DATA.]~~ then ~~[3.WRITING THE FIXED VALUES.]~~ Δ (Revision) [8.Writing of EEP-ROM Fixed Values]

How to adjust

- ① Make sure that the electric current and voltage of the connected rated voltage power supply are set to the set values. Then, turn the rated voltage power supply ON ~~for the contacts A and F.~~ Δ (Deletion)
- ② Select ~~"1.MR DUTY ADJUSTMENT"~~ in the menu of the AF-S zoom 200-400 VR inspection program. Δ (Revision) [1.Adjustment for Electrical Device] → [Adjustment for MR-duty(Adjustment 1 of 3)]
- ③ The confirmation screen for writing the fixed values in EEPROM appears. Select the appropriate item.
- ④ Following the instruction on the screen, rotate the MF ring slowly by hand in the direction from the infinity to the close distance position. Make sure that the waveform on the oscilloscope has duty 50% and stop the MF ring at the close distance-end.



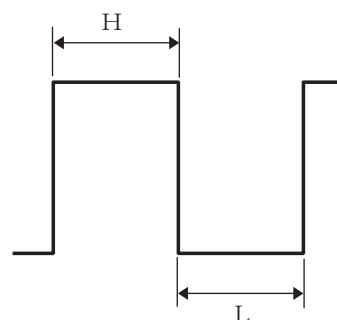
● Setting of oscilloscope

V/Div (CH1)	: 5V
V/Div (CH2)	: 5V
Coupling	: DC
Time/Div	: 5 m Sec
Trigger Mode	: NORMAL
Trigger Coupling	: DC
Trigger Source	: CH 1
Trigger Position	: +4 div
Trigger Type	: EDGE
Trigger Level	: 2.5 V

- ⑤ Following the instruction on the screen, rotate the MF ring slowly by hand in the direction from the close distance to the infinity position. Make sure that the waveform on the oscilloscope has duty 50% and stop the MF ring at the infinity-end.

Note : In case the waveform from infinity to close distance position or vice versa does not have duty 50%, repeat "INSPECTION AND ADJUSTMENT OF THE MR ENCODER OUTPUT WAVEFORM" on Page L23.

Standard H : L = 100 : 150 ~ 150 : 100 (50% $\pm$ 10.0%)



ADJUSTMENT OF DRIVING FREQUENCY AND MOTOR CONTROL

- In case of replacing the main PCB, SWM unit and MR encoder unit, be sure to make adjustments.
- ① The method of connection of the rated voltage power supply and measuring tools is the same as "ADJUSTMENT OF MR DUTY".
- ② Make sure that the electric current and voltage of the rated voltage power supply are set to the set values.
- ③ Turn the rated voltage power supply ON.
- ④ Select "~~2. ADJUSTMENT FOR DRIVING FREQUENCY & MOTOR CONTROL~~" in the menu of the AF-S
 △ (Revision) [1. Adjustment for Electrical Device] → [Adjustment for Frequency and Control(Adj. 2 of 3)]
 zoom 200-400VR inspection program. The lens automatically starts the driving of scanning.

△ (Revision)



△ (Revision)

- ⑤ When the above screen appears, select "Adjustment for Electrical Device" to make adjustments again.
In case the adjustment is not successful in spite of the above, the SWM unit or Main fixed tube unit may be defective.

INSPECTION OF LENS OPERATIONS

Check the lens operations by using a personal computer after assembling.

○ Check by personal computer

● Check by the following considerations:

1. MR encoder operations

- Drive the scanning of lens and check the difference in pulses at the start and end.
- In case the MR head of the MR encoder is malpositioned on the magnetic tape, the difference in pulses gets large.

2. Lens-servo stop accuracy

- Check the number of overrun/underrun pulses (deviation of the stop position from the target position) per the specified lens driving.
- In case the irregularity of mechanical operations does not take place in the focus ring driving unit, the underrun tends to occur if it is heavy in the cam ring rotation of the MR encoder, while the overrun tends to occur if it is light in its rotation of the MR encoder.

3. Lens-servo time

- Check the servo time (from starting and stopping the servo) when driving the specified lens by using the oscilloscope.
- In case the irregularity of mechanical operations does not take place in the focus ring driving unit, the servo-time tends to be long if it is heavy in the cam ring rotation of the MR encoder, while the servo-time tends to be short if it is light in its rotation of the MR encoder.

4. Switches and lenses

- Check the ON/OFF operations of switches, the distance encoder and zoom encoder.

● After inspections

1. When the MR encoder operations are not up to the standard:

Readjust the MR duty. (ref. Page L54.)

In case the pulse is not up to the standard, adjust the output waveform of the MR encoder again. (ref. Page L23.)

In case the pulse meets the standard, replace the cam ring unit.

2. When the lens-servo stop accuracy is not up to the standard:

Check the output waveform of the MR encoder. If it is normal, replace the Main fixed tube unit.

3. When the lens-servo time is not up to the standard:

Readjust the driving frequency and motor control.

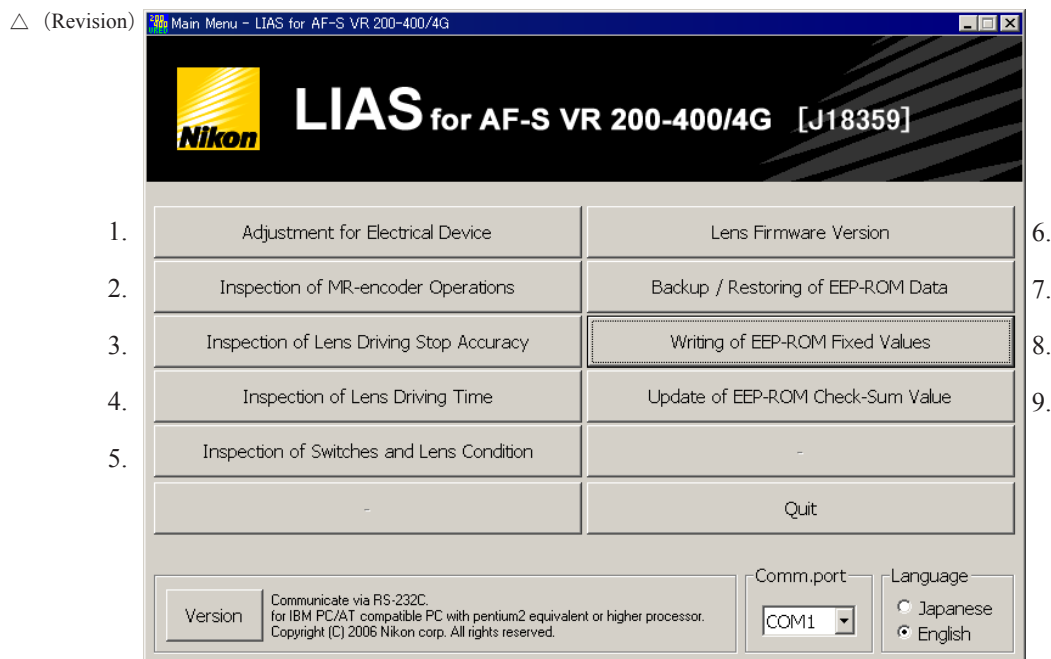
In case the lens-servo time is not up to the standard even after the readjustment, replace the Main fixed tube unit.

4. When switches do not work properly:

Check the wiring state of the troubled switch or replace it.

●AF-S zoom 200-400 VR inspection program

(1) Menu screen



• Menu items

△ (Deletion)
The item 1 ~~and 2~~ is used for adjustment.

The items 3 are used for reading and writing EEPROM DATA.

△ (Revision) 7~9

The items 4~7 are used for inspections.

△ (Revision) 2~5

• Selection items

After selecting items screens appear, such as the lens selection, the focal length selection, the voltage setting, the inspection mode start.

The screens depend on the items. Follow the instructions of the personal computer.

△ (Deletion)

→ ~~Operating voltage~~

△ (Deletion)

	Power supply for AF motor -inside lens	Power supply for AF-I communication box
Inspection of MR encoder operation	-6.0 ± 0.1 V	5.5 ± 0.2 V
Inspection of lens-servo stop accuracy	-6.5 ± 0.1 V	
Inspection of lens-servo time	-6.5 ± 0.1 V	
Inspection of switches and lenses	6.0 ± 0.1 V	

△ (Deletion)

→ ~~Initial driving~~

When "WAIT FOR SOME SECONDS" appears, perform the initial driving (drive scanning five times and stop at infinity-end):

(2) Inspection of MR encoder operations

△ (Revision)

Caution : If the MF ring is rotated while the lens scanning is driven, the pulse shows an abnormal value.

Do NOT touch the MF ring during operations.

Make inspections at the 5 positions as below:

△ (Deletion)

△ (Deletion) (~~Lens position in inspecting~~)

Lens inclination	Position of index window
Horizontal	Up, right and left
Front lens group 90° upward	
Front lens group 90° downward	

△ (Revision)

When the inspection ends, the inspection result of the next page is displayed.

The difference in pulse before and after the inspection must be within the standard.

Standard of the difference in pulse : 0 ± 10 PULSE(S)

Standard of the total pulses : 26547 ± 200 PLUSE(S)

△ (Revision)

The screenshot shows a software window titled "LIAS for AF-S VR 200-400/4G". The main heading is "Inspection result of MR-Encoder Operations: Good".

Under the heading "Difference in pulse no. when beginning and ending inspection", there are four input fields:

- Standard: no specify
- Difference in pulse no.: 9
- Pulse no. when inspection begins: 27810
- Pulse no. when inspection ends: 27801

Under the heading "Total no. of pulses from Close-end to Infinity-end", there are two input fields:

- Standard: from 26347 to 26747
- Total no. of pulses: 26578 (OK)

On the right side of the window, there are two buttons: "Start" and "Close".

(3) Inspection of lens-servo stop accuracy

- This inspection must be made at the following 5 lens positions with the focal length [both 200 mm (W) and 400 mm (T)].

(Lens position in inspecting)

Lens inclination	Position of index window
Horizontal	Up, right and left
Front lens group 60° angle upward	
Front lens group 60° angle upward	

- If the lens stops while inspecting the lens-servo stop accuracy, input a figure in " Delay time"of the below "Fig.1", from "0" to "1000" for the delay time (msec: millisecond) which prevents stopping the lens.

Note:

The value of "ADJUST DELAY-TIME" is set by the adjustment software. So, if the lens does not stop during the inspection of "LENS DRIVING STOP ACCURACY", any value can be input without problem. However, the larger the value of "Delay time" gets, the longer the inspection time becomes.

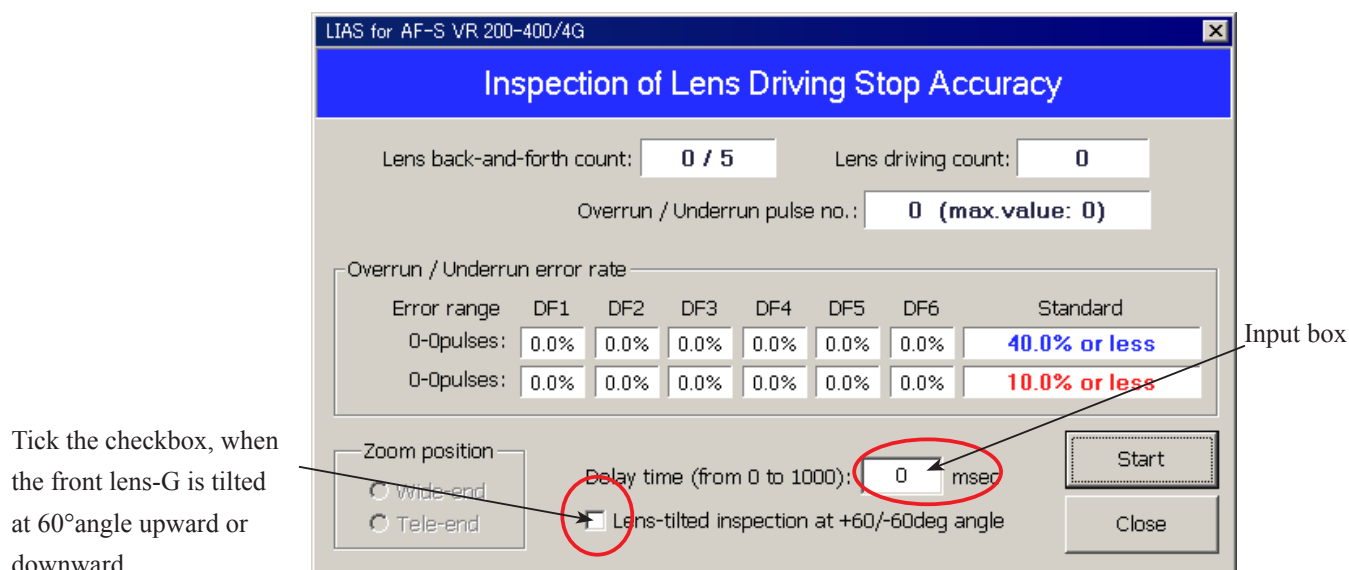


Fig.1

LIAS for AF-S VR 200-400/4G

Measuring Stop Acc. in progress (DF2: from inf. to close)

[1] → Lens back-and-forth count: **5 / 5** Lens driving count: **838**

[4] → Overrun / Underrun pulse no.: **1 (max.value: 5)**

Overrun / Underrun error rate

Error range	DF1	DF2	DF3	DF4	DF5	DF6	Standard
[2] → 11-30pulses:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.0% or less
[3] → 21-30pulses:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0% or less

Zoom position
☐ Wide-end
☒ Tele-end

Delay time (from 0 to 1000): msec

☐ Lens-tilted inspection at +60/-60deg angle

Start
Stop

Caution : If the MF ring is rotated while the lens scanning is driven, the pulse shows an abnormal value. Do NOT touch the MF ring during operations.
During the lens driving, the above screen is displayed.

The number of overrun/underrun pulses must be within the standards after the 5 lens back-and forth driving motions ("5/5TIME (S)." in [1] of the display).

Standard	40% or less for Df1~Df6.	[2] of the screen
	(Occurrence ratio of 11~30 pulses)	
	10% or less for Df1~Df6.	[3] of the screen
	(Occurrence ratio of 21~30 pulses)	
	Occurrence of 31 or more pulses is zero for Df1~Df6.	[4] of the screen
	(Only one occurrence indicates malfunction.)	

※ "Df1~Df6" shows the lens driving amount.



(4) Inspection of lens-servo time

△ (Revision)

Drive amount	Standard	Standard (+60/-60deg)
DF1	45msec or less	54msec or less
DF2	55msec or less	66msec or less
DF3	65msec or less	78msec or less
DF4	80msec or less	96msec or less
DF5	95msec or less	114msec or less
DF6	105msec or less	126msec or less

△ (Deletion)

- ~~Connect the probes of oscilloscope to E and H terminals of the AF-I communication box (J15306).~~ Select the servo driving amount respectively. Each lens-servo drive time must be within the standard.

△ (Addition)

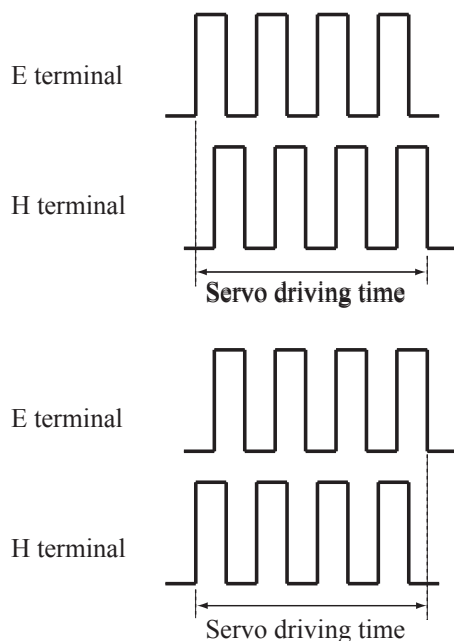
- This inspection must be made at the following 5 lens positions with the focal length [both 200 mm (W) and 400 mm (T)].

(Lens position in inspecting)

Lens inclination	Position of index window
Horizontal	Up, right and left
Front lens group 90° upward △ (Revision) 60° angle	
Front lens group 90° downward △ (Revision) 60° angle	

Caution : If the MF ring is rotated during inspections, the waveform shows an abnormal value. Do NOT touch the

MF ring during inspections. ~~Make inspections at the 5 positions as below.~~



●Oscilloscope setting

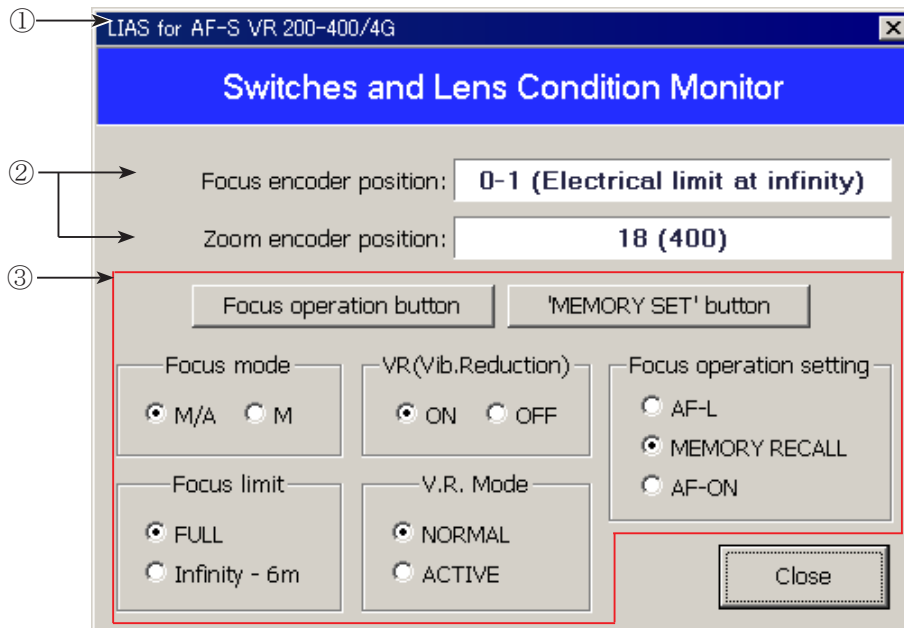
V/Div	: 5V
Coupling	: DC
Time/Div	: 20 m Sec
Trigger Mode	: SGL (S)
Trigger Coupling	: DC
Trigger Source	: CH1

※ The waveforms of E and H terminals have the forms for going up for start and going down for start.



(5) Inspection of switches and lens conditions

△ (Revision)



① Type of lens.

△ (Deletion) ② ~~The version of CPU in the lens.~~

△ (Revision) ②④ The signals of the focusing encoder and zooming encoder.

The value changes by turning the MF ring with M or M/A of the lens driving mode selector.

△ (Revision) ③④ The status of Switches

△ (Deletion) ⑤ ~~The helicoid position (close distance, medium distance or infinity) based on the focusing encoder signal.~~

When replacing a part listed below, Some adjustment may be required

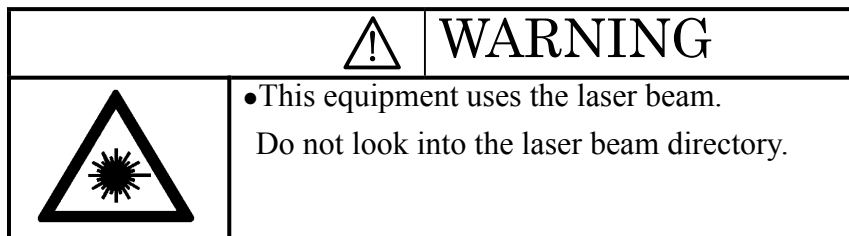
Item of Adjustment	Parts Replaced	Adjustment for MR duty Δ (Addition) (Necessary to write fixed value <u>when</u> the main PCB is replaced.)	Inspection and adjustment for the waveform output from MR encoder	VR Adjustment
		Adjustment for frequency control		
Main PCB		☐		☐
SWM		☐		
MR Unit				☐
Jyro PCB				☐
MR head unit		☐	☐	
Main fixed tubu unit		☐	☐	

Note: Do Not tick off the adjustment item "EEPROM Initial Values Rewriting" of VR adjustment Software, because it affects other adjustments than VR.

If "EEPROM Initial Values Rewriting" is performed, make an adjustment again starting from Page L52.

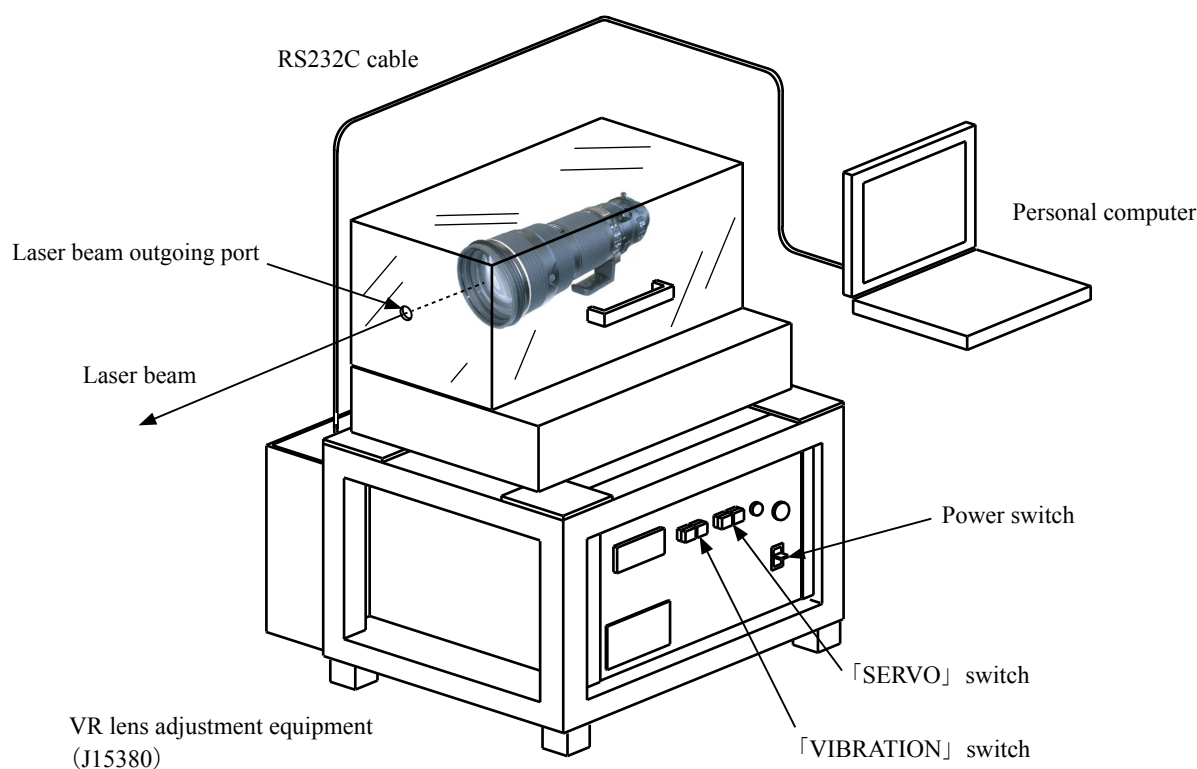
VR ADJUSTMENT

When performing the VR adjustment, please refer to the [Instruction Manual] attached to the VR lens adjustment equipment (J15380).



Preparation for the VR adjustment

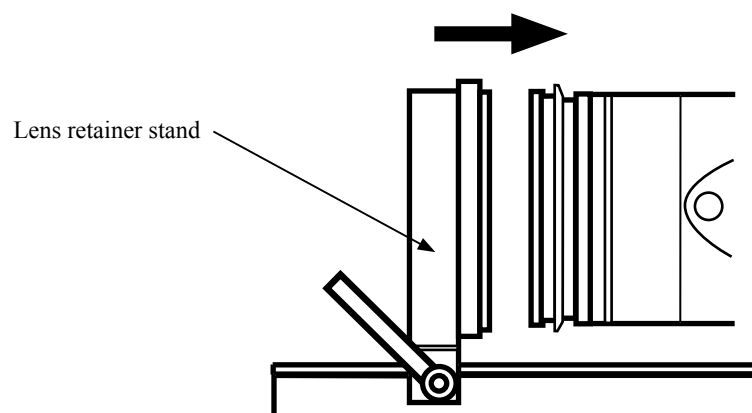
- ① Set up the VR lens adjustment equipment (J15380) as shown in Figure below.
- ② Connect the personal computer to the equipment and run the personal computer.
- ③ Mount the lens on the equipment. Set the focus ring to the infinity position and the zoom ring to TELE side.
Please refer to the next page for the procedure to mount the lens.



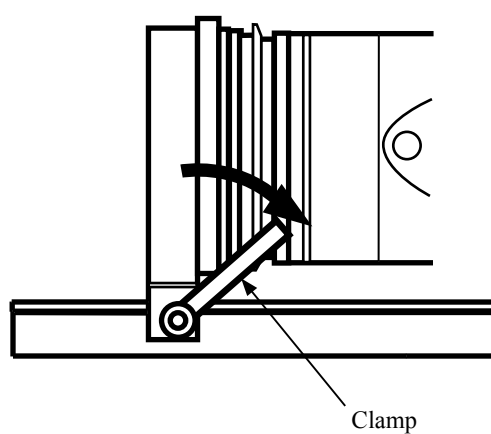
Notes: The distance from the laser beam outgoing port to the radiation face should be about 5m apart.
Do not intercept the optical path of the laser beam.

Procedure to mount the lens

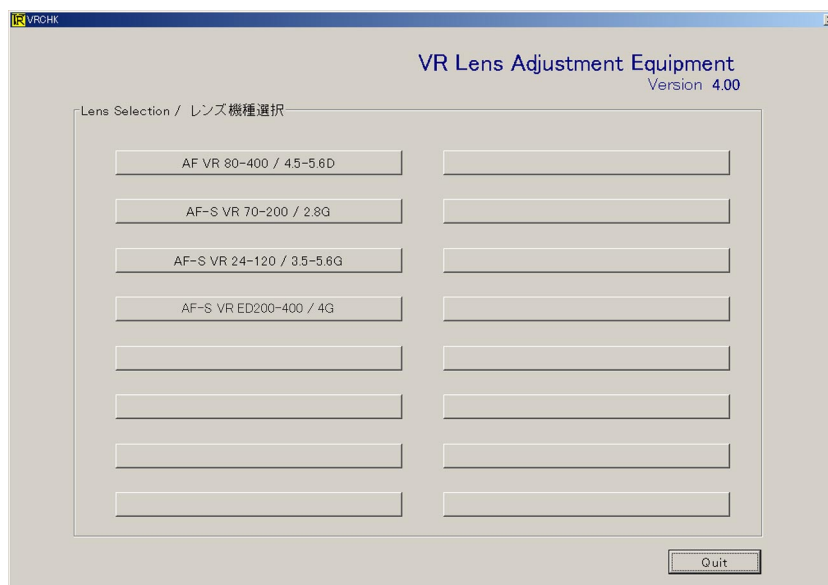
- 1 . Attach the lens to the equipment and move the lens retainer stand in the direction of the arrow.



- 2 . Move the lens retainer stand to the position shown in Figure below and fix it by tightening the clamp.



- ④ Turn on the VR lens adjustment equipment (J15380) and run the adjustment software.
- ⑤ Move the cursor to [AF-S VR ED200-400/4G] in the Lens Selection window and click it.



- ※ If the below message appears, set the zoom ring again by referring to the pre-page [Procedure to mount the lens] and click the [OK] button.
The focus ring is automatically set.



Notes : Do not change the lens settings (zoom ring) until the adjustment is finished and it goes back to the Lens Selection window.

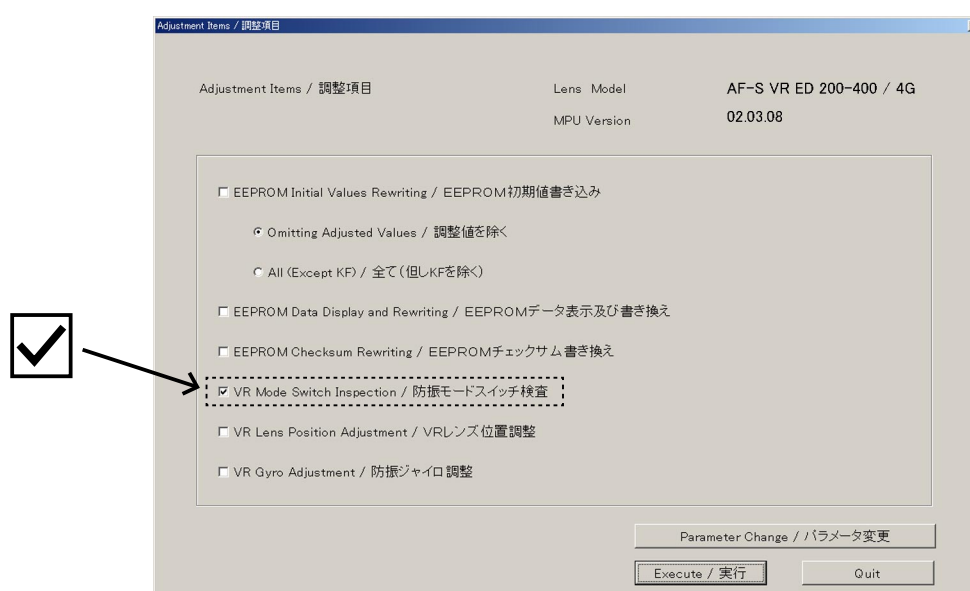
If the setting position changes in the middle of the adjustment, the correct adjustment value cannot be obtained

Do Not tick off the adjustment item "EEPROM Initial Values Rewriting" because it affects other adjustments than VR.

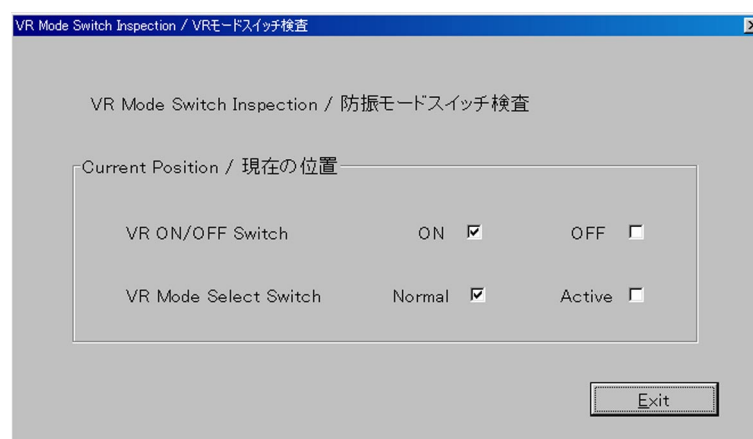
If "EEPROM Initial Values Rewriting" is performed, make an adjustment again starting from Page L52.

VIBRATION REDUCTION MODE SW INSPECTION

- ① Move the cursor to a box in front of the [VR Mode Switch Inspection] and click to mark the check marking.
- ② Move the cursor to the Execute button and click it.

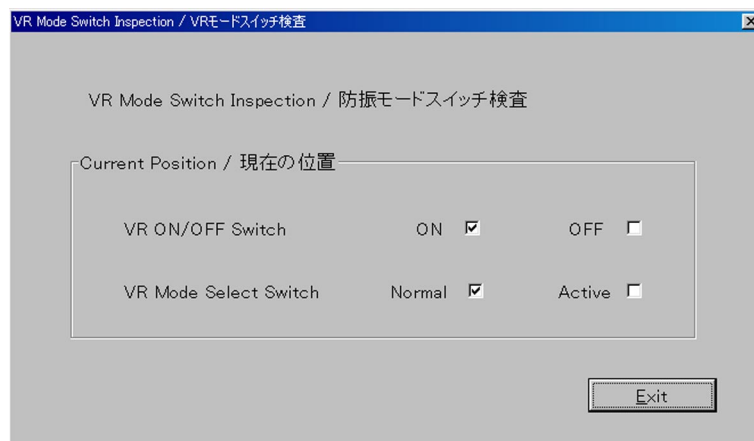


- ③ VR Mode Switch Inspection window is shown.

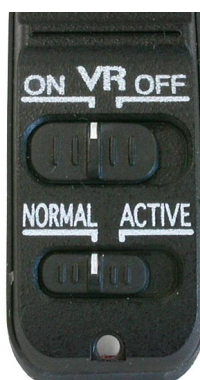


- ④ The position of VR mode switch is indicated.

By turning the VR mode switch, the current position is shown in the real time.



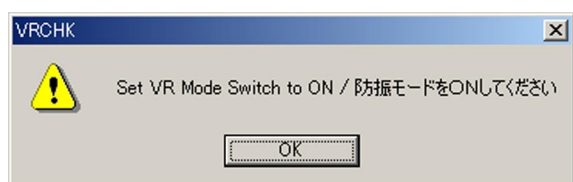
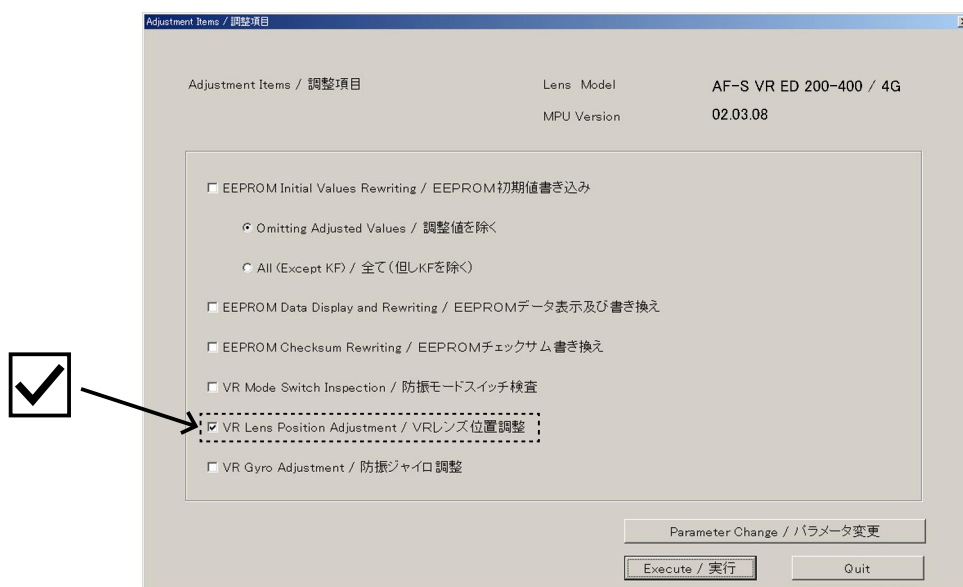
VR mode switch



- ⑤ When finishing the VR mode switch, move the cursor to the [Exit] button and click it to evacuate from the inspection window.

VR LENS POSITION ADJUSTMENT

- ① Move the cursor to a box in front of the [VR Lens Position Adjustment] and click it to mark the check marking.
- ② Move the cursor to the Execute button and click it.



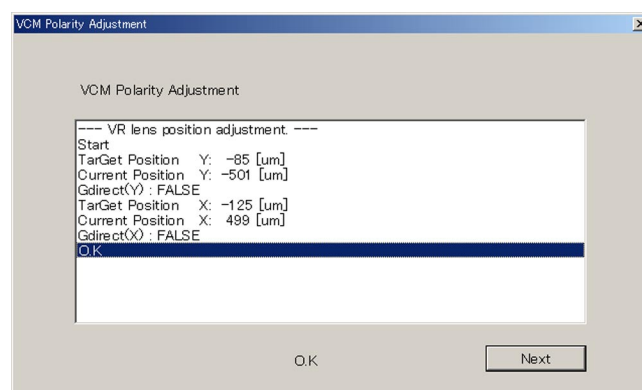
- ③ The message like a picture on the left is shown.
Set the VR mode switch of the lens to ON (Full or Release), and then move the cursor to the OK button and click it.

• VCM Polarity Adjustment (Controlled automatically)

Detect the polarity of the VCM (Voice Coil Motor) and write it in EEPROM as the compensation value.

In-between times, the message to confirm the lens position of angle (0 or 90degrees) appears.

So, set the lens to the position and click the [OK] button.



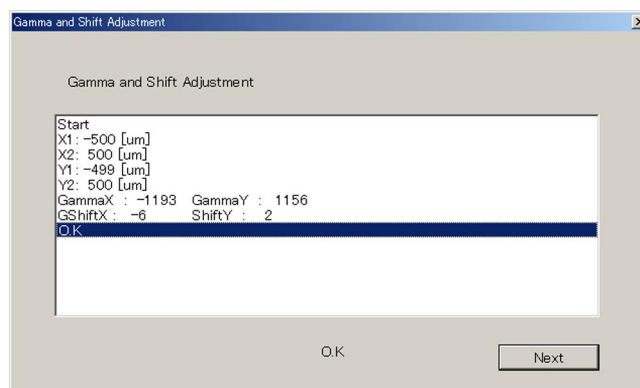
When [OK] is shown on the window, move the cursor to the Next button and click it.

• Gamma and Shift Adjustment (Controlled automatically)

Adjust the inclination and control center position on the basis of the position sensor output in the VR unit.

In-between times, the message to confirm the lens position of angle (0 or 90degrees) appears.

So, set the lens to the position and click the [OK] button.



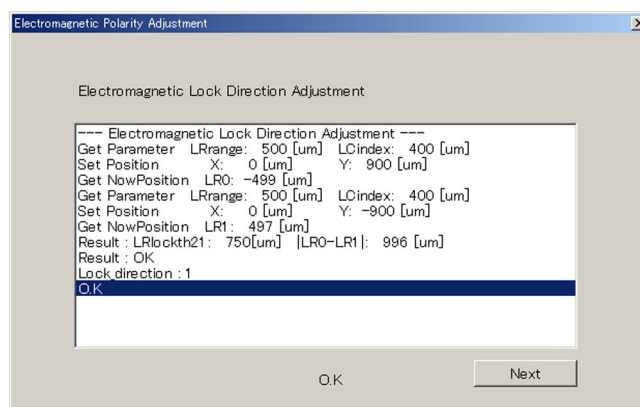
When [OK] is shown on the window, move the cursor to the Next button and click it.

• Electromagnetic Lock Center Position Adjustment (Controlled automatically)

Adjust the electromagnetic lock center position.

In-between times, the message to confirm the lens position of angle (0 or 90degrees) appears.

So, set the lens to the position and click the [OK] button.



When [OK] is shown on the window, move the cursor to the Next button and click it.



- When the message that says rewriting the checksum is finished is shown, click the [OK] button.

Then set the VR mode to OFF according to the message and click the OK button to evacuate from the adjustment window.

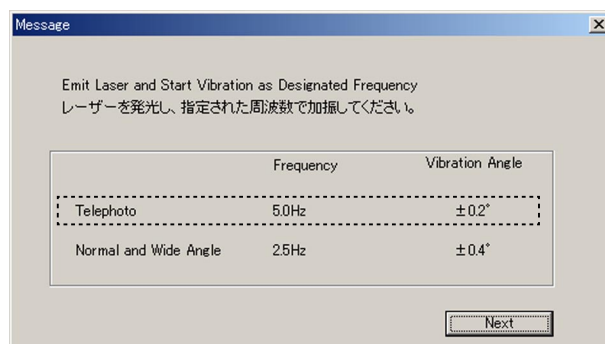
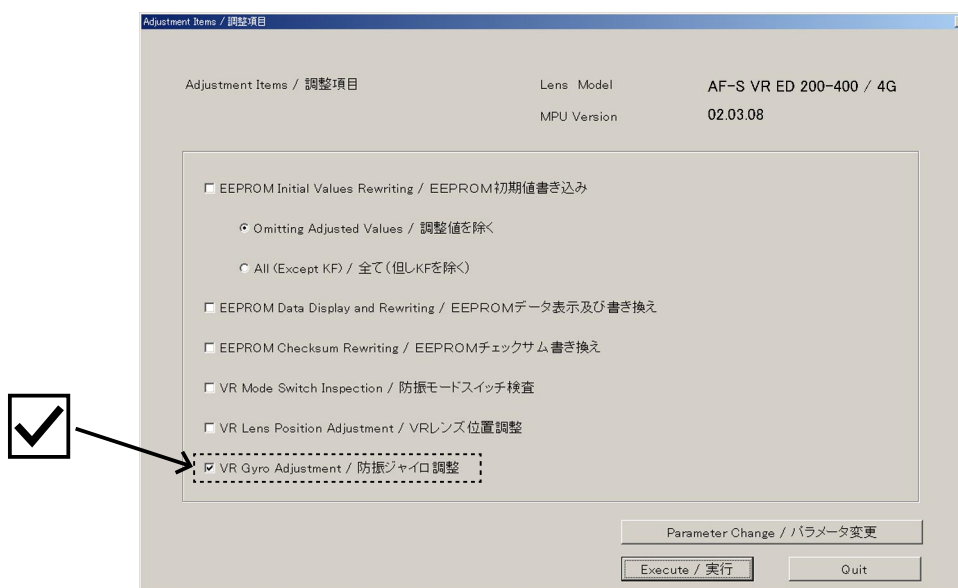
Notes :

If [NG] is shown in the middle of the adjustment, click the Next button. This makes it possible to evacuate from the inspection mode and to go back to the Lens Selection window after rewriting the checksum value. Then adjust it again.

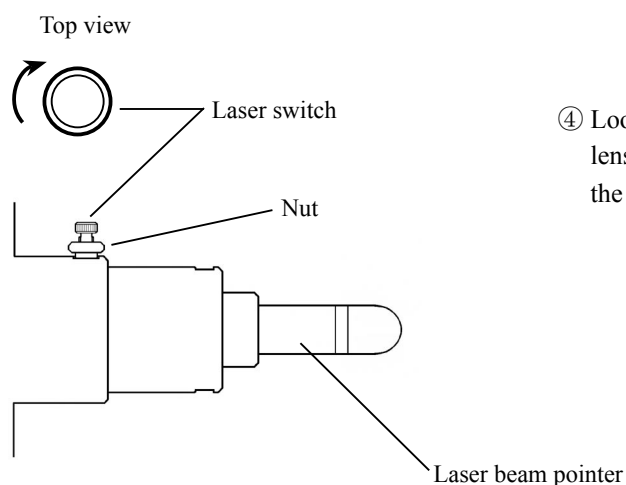
If it becomes be [NG] even performing the adjustment a few times, the VR unit, the gyro PCB or the main FPC might be defective.

VR GYRO ADJUSTMENT

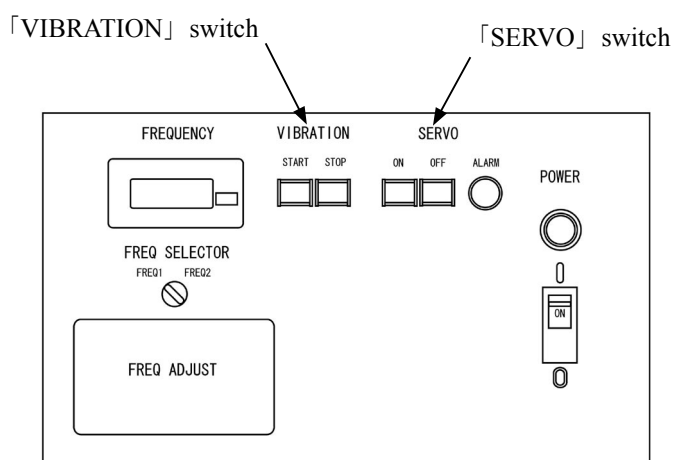
- ① Move the cursor to a box in front of [VR Gyro Adjustment] and click it to mark the check marking.
- ② Move the cursor to the Execute button and click it.



- ③ The message like a picture on the left is shown.
Set it to the Telephoto settings.

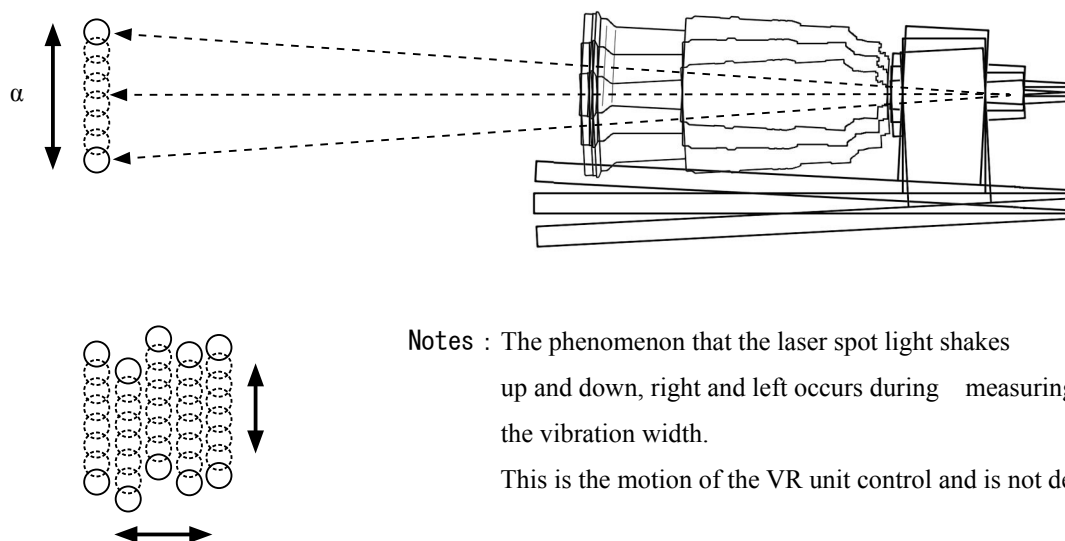


- ④ Loosen the nut of the laser switch of the VR lens adjustment equipment (J15380) and rotate the screw in an arrow direction to give the laser.



- ⑤ Press the SERVO [ON] button and the VIBRATION [START] button of the VR lensadjustment equipment (J15380).

- ⑥ With the equipment starts to vibrate, measure the length of the vibration width α of the laser beam.



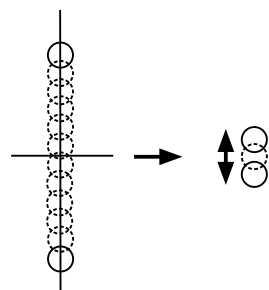
Notes : The phenomenon that the laser spot light shakes up and down, right and left occurs during measuring the vibration width.
This is the motion of the VR unit control and is not defective.



- ⑦ Move the cursor to the Next button in the message box on the screen and click it.

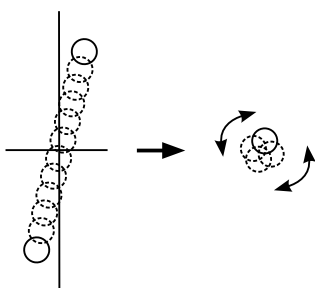
Vibration reduction function starts to perform and the vibration width of the laser beam becomes be narrow.

• Angle Difference Adjustment



If there is angle difference, the laser beam source becomes be whether if it rotates round even performing the Gyro Gain Adjustment.

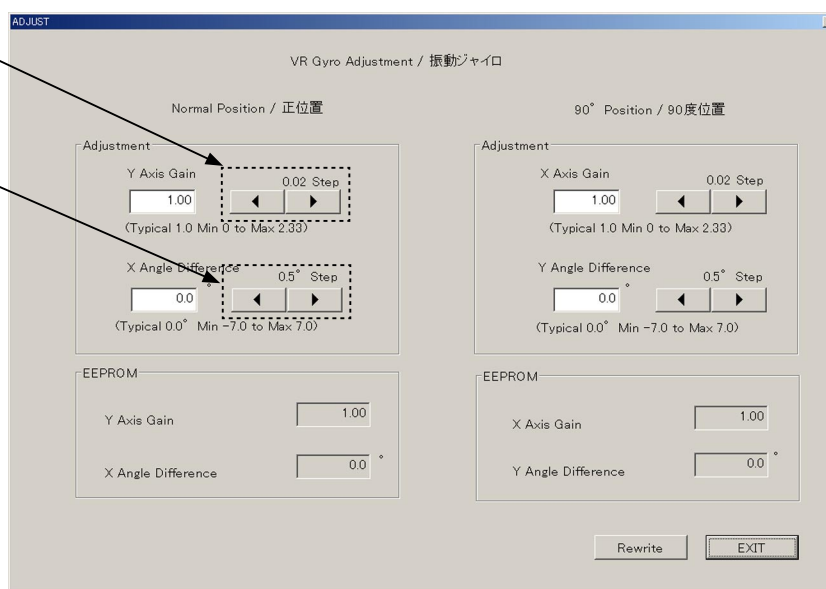
If it is possible to confirm the angle difference, adjust it by the buttons for the angle difference adjustment.



Notes : After operating the adjustment button, wait for a few seconds until a vibration motion is stabilized.

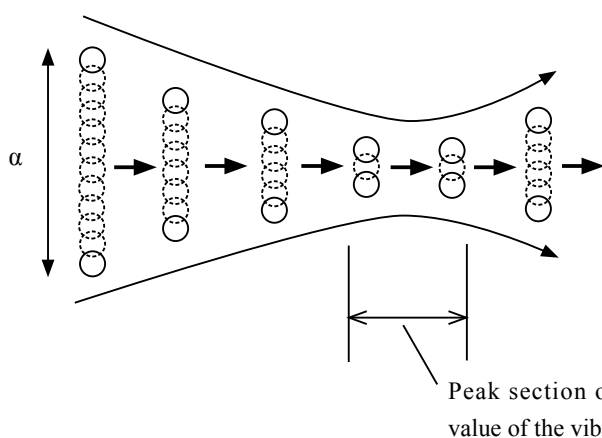
Buttons for [Gyro Gain]
Adjustment

Buttons for
[Angle Difference] Adjustment



• Gyro Gain Adjustment

Adjust the vibration width by the button for Gyro Gain Adjustment so that the length of the vibration width becomes be less than 1/5 of the measured laser vibration width a.

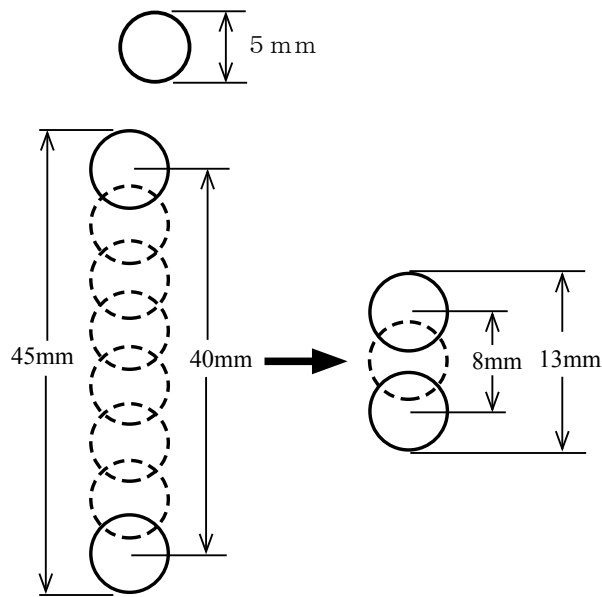


Standard: Less than 1/5 of the vibration width a

Notes : The laser beam vibrates widely again after it passes the peak section of the minimum value.

《Reference》

- The laser spot beam is irradiated about 5mm in diameter at 5 m ahead.

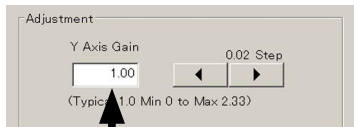


- ① To adjust the vibration width at the center of the laser spot beam, measure the whole vibration width first.
- ② Subtract the radius of the laser spot (oblique lined part) from the top and bottom of the measured vibration width.

Example)
When the whole vibration width is [About 45mm],
the center vibration width becomes be
 $45 - (2.5 + 2.5) = 40\text{mm}$.

Standard after the gyro gain adjustment
 $40 \times 1/5 = 8.0\text{mm}$ (Center vibration width)
Whole vibration width becomes be
 $8 + (2.5 + 2.5) = 13\text{mm}$.

- How to obtain the minimum value of the vibration width
 - ① Measure the vibration width while changing the adjustment value that is set every 0.02Step as shown below.
 - ② The peak section of the minimum vibration width can be obtained by the actual measured value.
 - ③ Take the center of the peak section as the adjustment value.

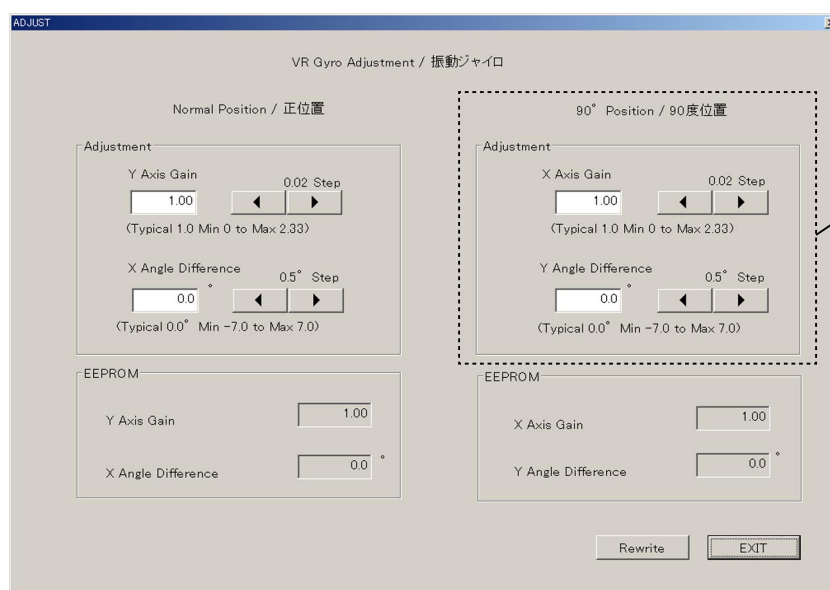
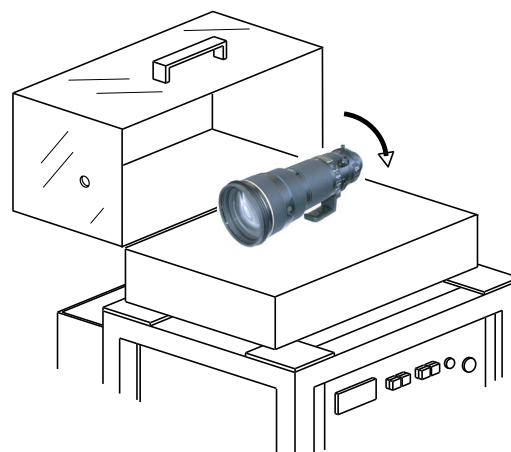


Gyro Gain Adjustment Value	Vibration width Actual measured value
.	.
.	.
0. 9 0	1 5. 0 mm
0. 9 2	1 4. 5 mm
0. 9 4	1 4. 0 mm
0. 9 6	1 3. 5 mm
0. 9 8	1 3. 0 mm
1. 0 0	1 3. 0 mm
1. 0 2	1 3. 0 mm
1. 0 4	1 3. 5 mm
1. 0 6	1 4. 0 mm
1. 0 8	1 4. 5 mm
1. 1 0	1 5. 0 mm
.	.
.	.

Notes : When measuring the vibration width, read it in unit of 0.5mm.

- Rotate the lens 90 ° in an arrow direction and then adjust the angle difference and the gyro gain.

Notes : When adjusting the lens at 90 ° position, adjust it by the buttons for the adjustment at 90 ° position as shown in Figure below.



Buttons for adjustment at 90 ° position

- After the adjustment, click the [Rewrite] button to write the adjustment value in EEPROM in the lens.
- Then, click the [EXIT] button to evacuate from the adjustment mode.

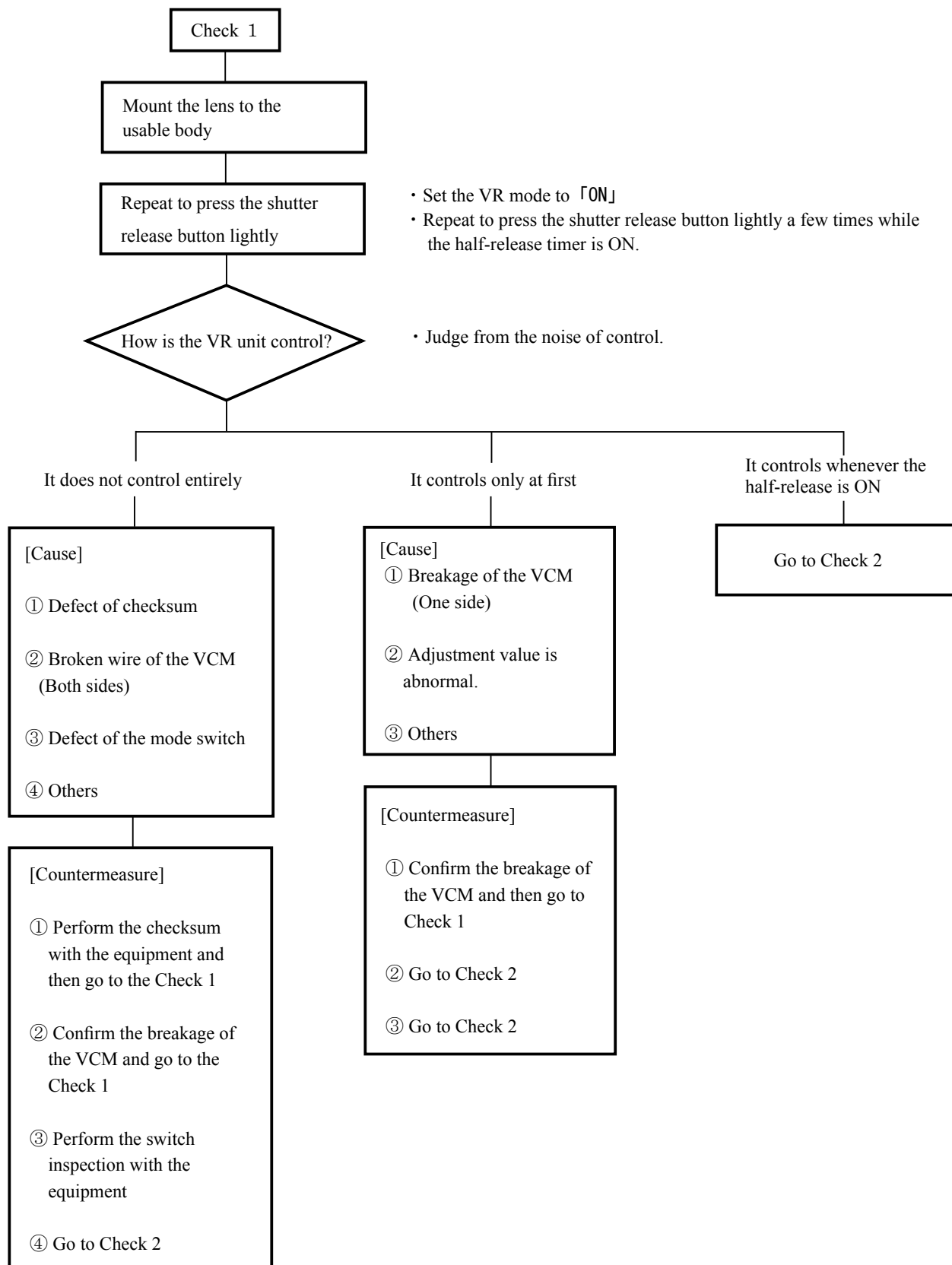
Notes : If clicking [EXIT] button after not clicking the [Rewrite] button, the adjustment value is not stored and the adjustment is not influenced.

- Click the [Quit] button at the Adjustment Items window to go back to the Lens Selection window.

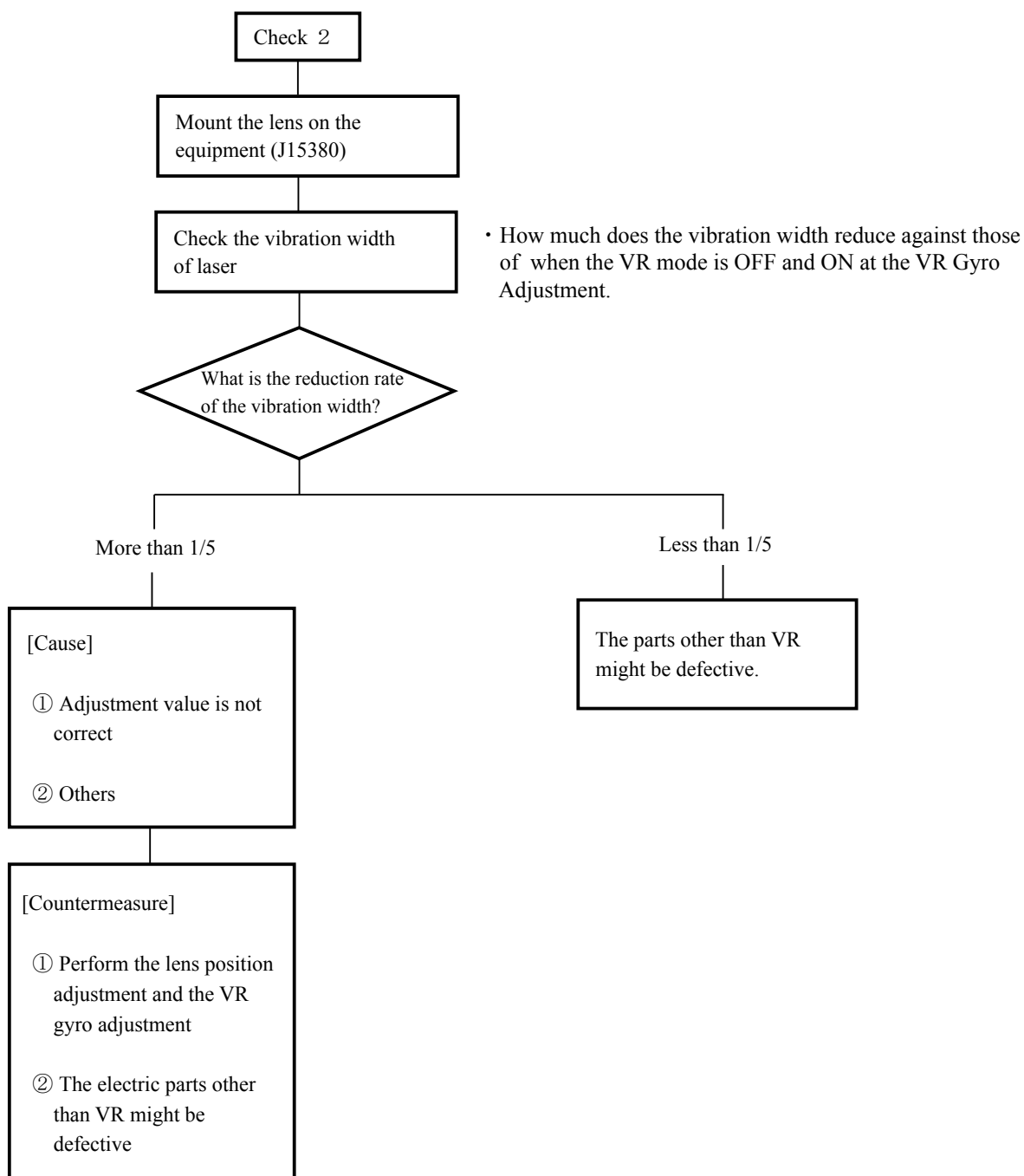
Notes : Do not remove the lens or turn OFF the VR lens adjustment equipment until it goes back to the Lens Selection window. The trouble that the adjustment value is not stored correctly, etc. occurs since the communication is cut off.

STANDARD TO JUDGE THE VR PERFORMANCE

Please refer to the following chart before performing the VR adjustment for the product of which VR is defective with the equipment.



Go on the next page [Check 2]



Aberration compensation data writing adjustment

- This adjustment uses the software which calculates the aberration compensation data according to the feature of lens aberration and writes in EEPROM of the lens, in order to improve the accuracy of autofocus.

Note: This adjustment is necessary when the main PCB and/or each lens part (glass, lens chamber) is replaced or when each lens part is disassembled. Be sure to make this adjustment after completing inspecting and adjusting the main PCB.

(1) Preparation

- Test chart (Self-made tool: ref. Procedure for how to create it.)
- Tripod
- D100
- Personal computer
- USB cable (UC-E4)
- Adjustment software (LWM.exe : used for the lens optical alignment.)

(2) Procedure for how to create Test chart

- Photocopy the next page and cut out 1 target chart and 5 resolution charts.



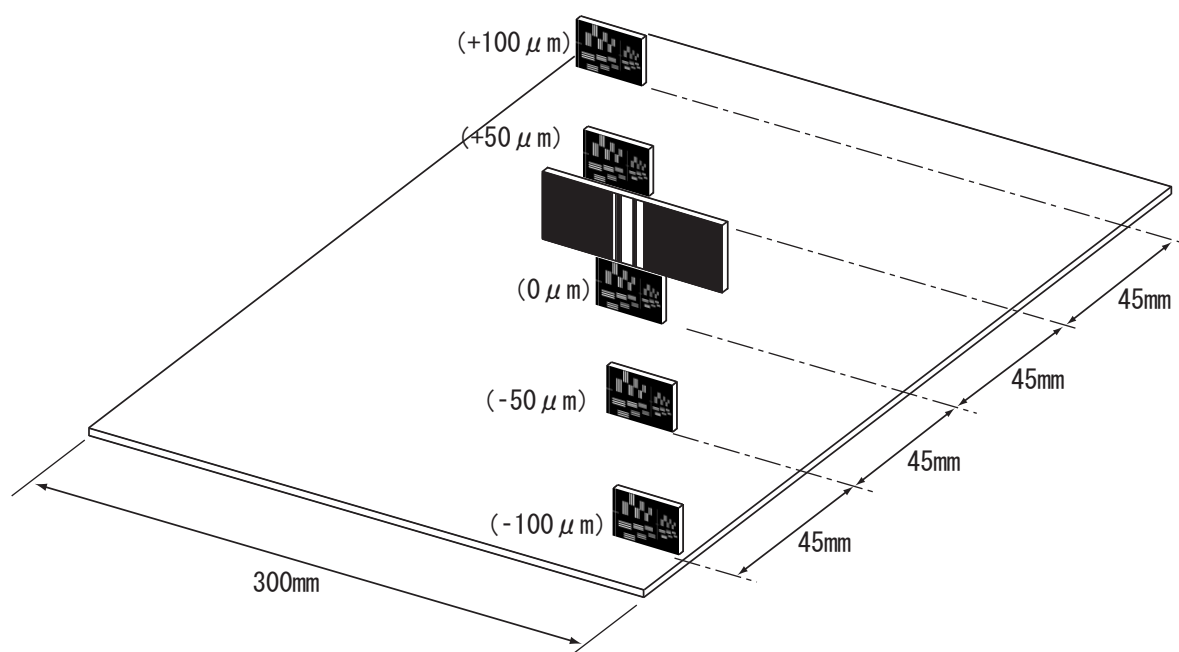
(Target chart)



(Resolution chart)

- As shown below, put each chart in position at the specified spacings.

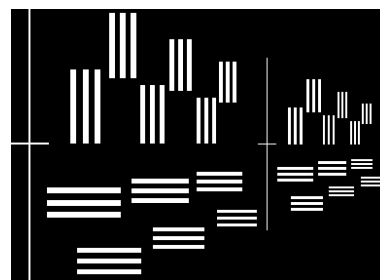
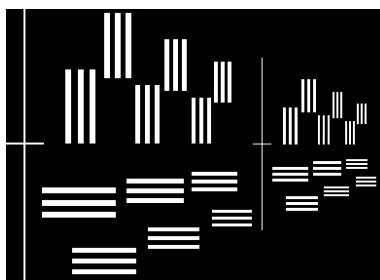
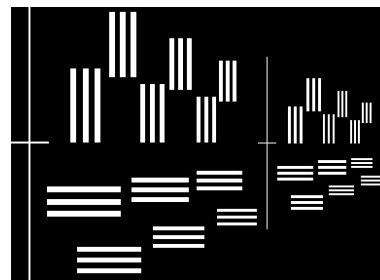
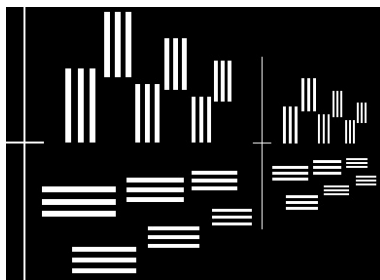
Note: Only about the center, put the target chart on the central resolution chart.



(Target chart)

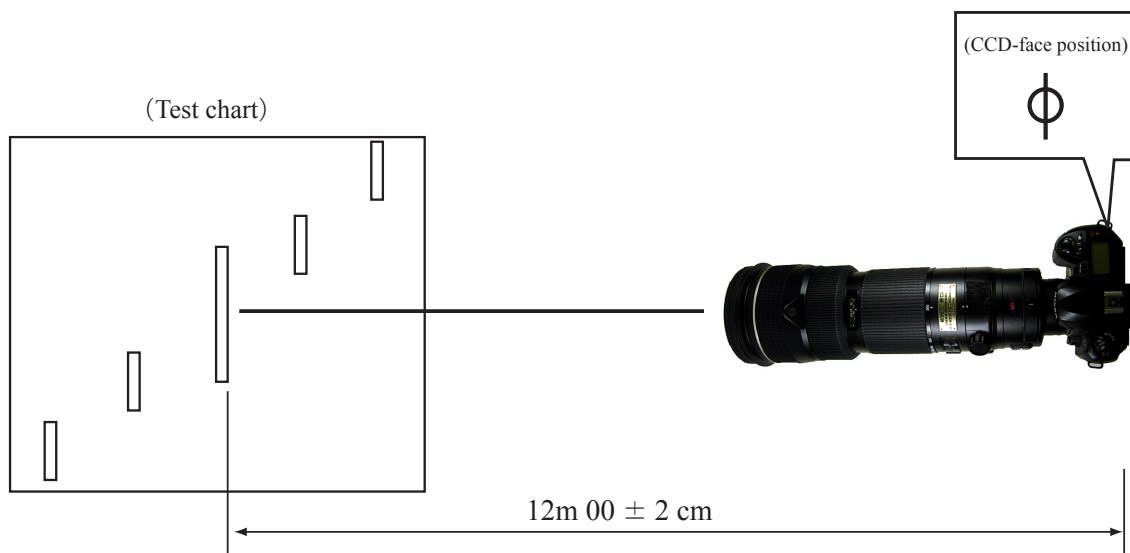


(Resolution chart)

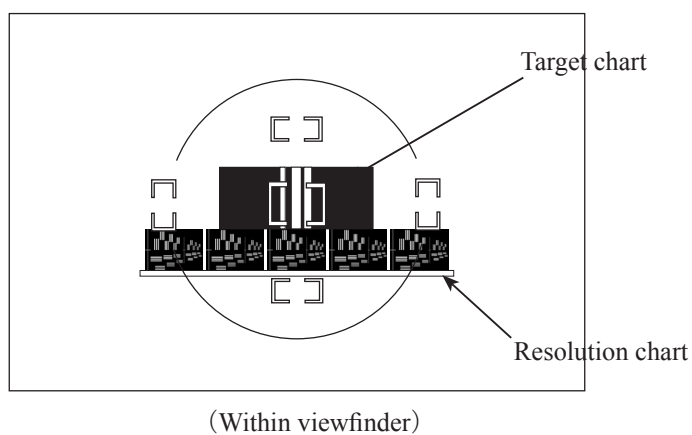


(3) Writing aberration compensation data

- ① Prepare a camera (D100). Set the "Exposure mode" to "A" for full aperture and "Focus mode" to "S".
On the shooting menu, set the "Image quality mode" to "FINE", "Image size" to "L", "WB" to "Preset", and "ISO" to "200".
- ② Set up the camera (D100), in which the lens to be inspected is fit, on the tripod. Set the focal length to 400 mm, and the distance between the test chart and camera (CCD face) to 12 m 00±2 cm.

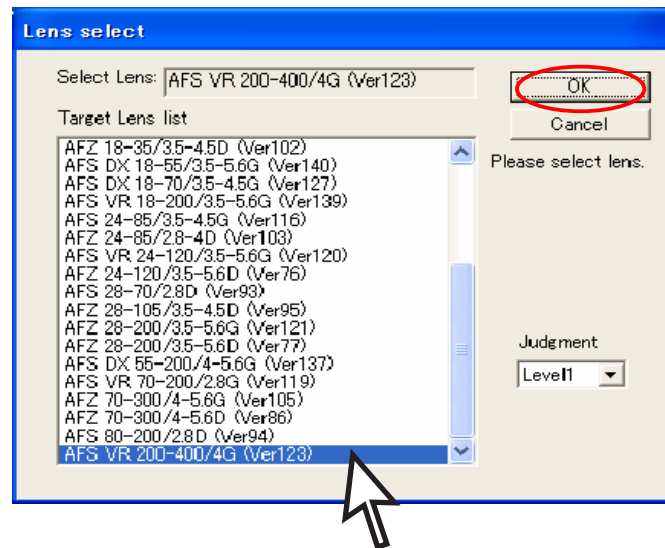


- ③ As shown below, bring the target chart in the center of focus area within viewfinder.

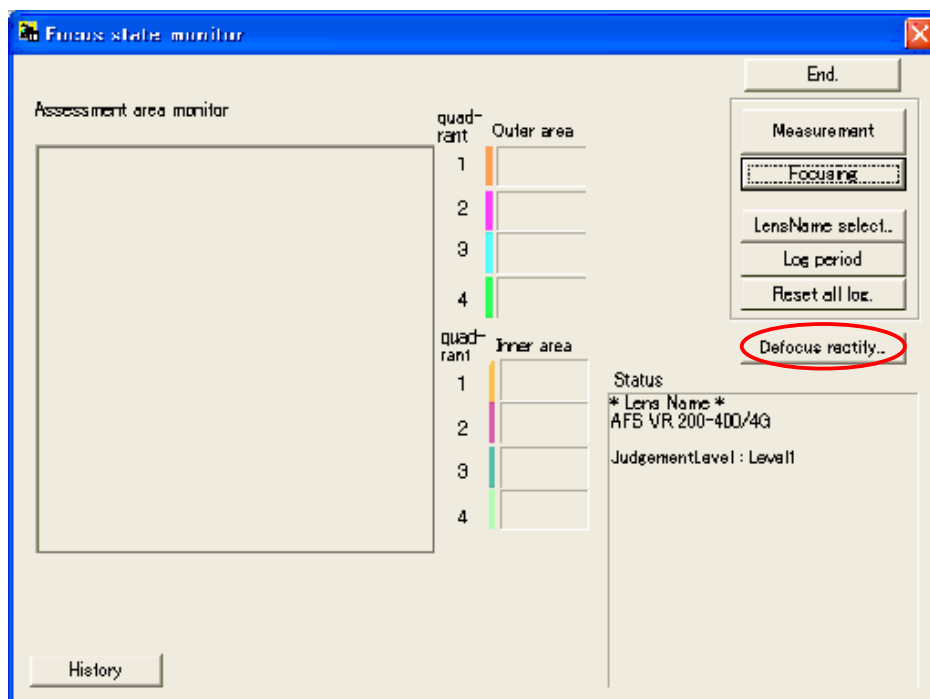


- ④ Connect the PC and camera via USB cable. (Camera setting: Mass storage)
- ⑤ Start the adjustment software (LWM.exe).

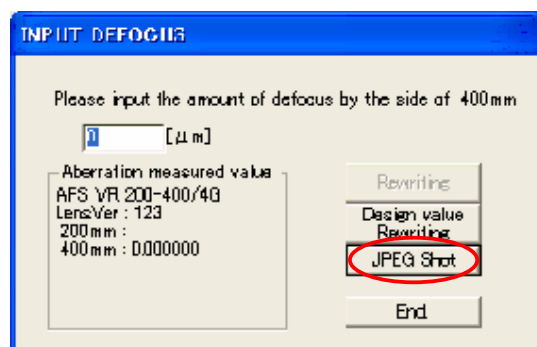
- ⑥ Select "AF-S VR200-400/4G" from "Target lens list", and click "OK" button.



- ⑦ Click the "Defocus rectify..." button.

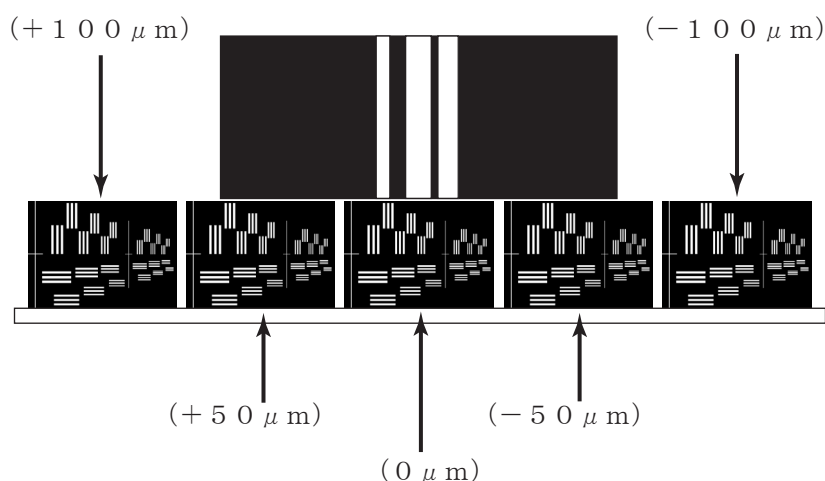


- ⑧ Click the "JPEG Shot" button.

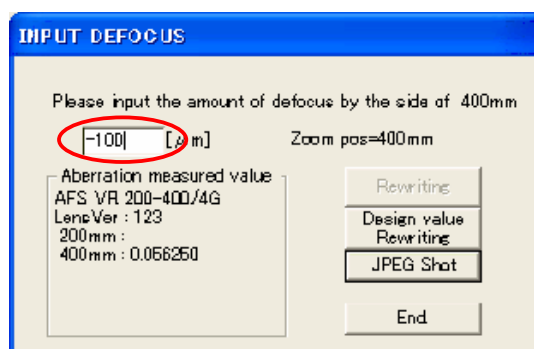


- ⑨ The shutter is released after the AF operation. The shot image is automatically displayed on the PC screen. Scale the image to 100% and check which chart is in focus of the 5 resolution charts.

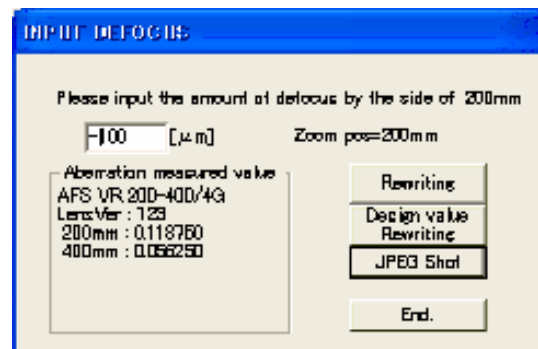
Note: As for this lens, even if the aperture is fully open, the depth of field is so deep that when looking for the center of focus, compare 2 charts between which there are 2 or more charts.



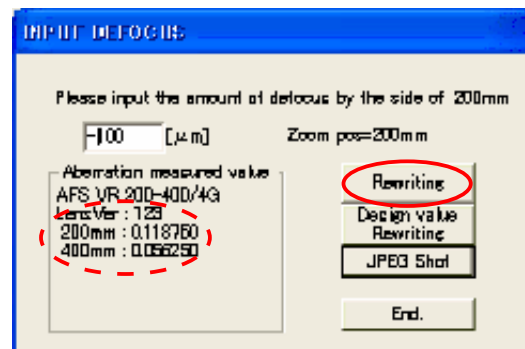
- ⑩ Input the value of the focused position into the entry field.
e.g. The below is the case when "-100μm" of the front focus side is in focus.



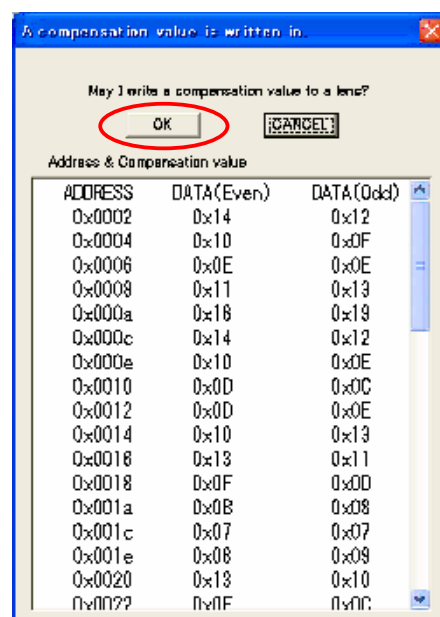
- ⑪ Set the focal length of the lens to 200 mm, and the distance between the test chart and camera (CCD face) to $6m00 \pm 2$ cm.
- ⑫ Perform the operations from ⑧ to ⑩ of the previous page.



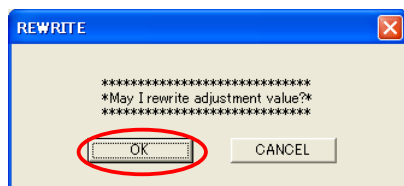
- ⑬ Check that the values of all the focal lengths are displayed within the dotted red circle. Then click on "Rewriting".



- ⑭ When "A compensation value is written in." is displayed, click "OK".



- ⑮ The reconfirmation screen is displayed. Click "OK".

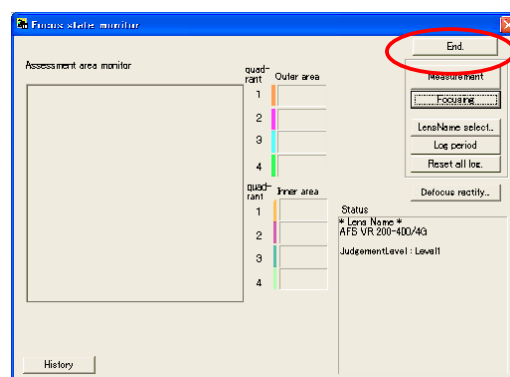
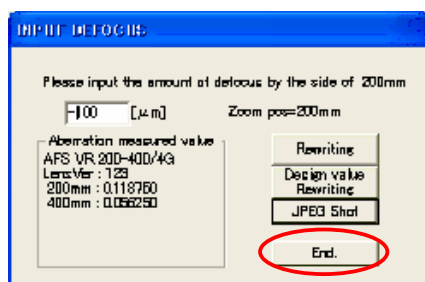
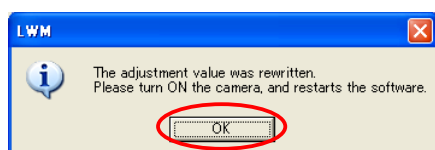


- ⑯ An hourglass is displayed on the screen, and writing starts.

The below screen is displayed after a few seconds. Turn camera OFF and turn it ON again.

Click "OK", and the adjustment software restarts.

Note: Unless the camera is turned off once, the value that was written in EEPROM is not reflected.

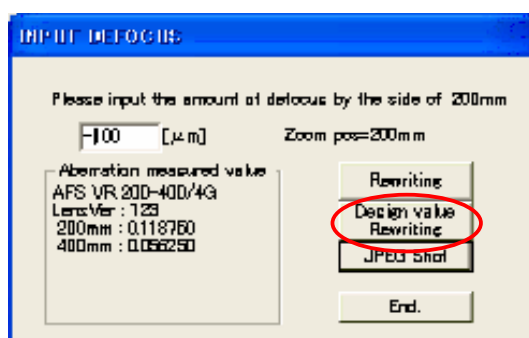


- ⑰ When the adjustment software restarts, perform the operations from ② to ⑫ again. Check that "0μm" of the AF position is in focus.

(It is also possible, after Wide-side shooting of ⑪, to take the Tele-side shooting of ②.)

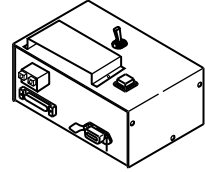
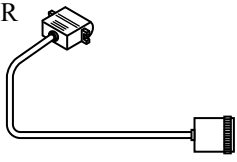
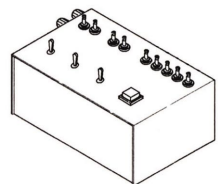
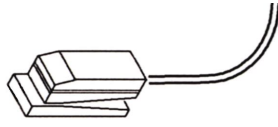
If "0μm" is not in focus, repeat the operations from ② to ⑰.

If it is not still in focus even after repetition, the written value in EEPROM may be abnormal. So click "Design value Rewriting" to write the initial value, then proceed with the operations.

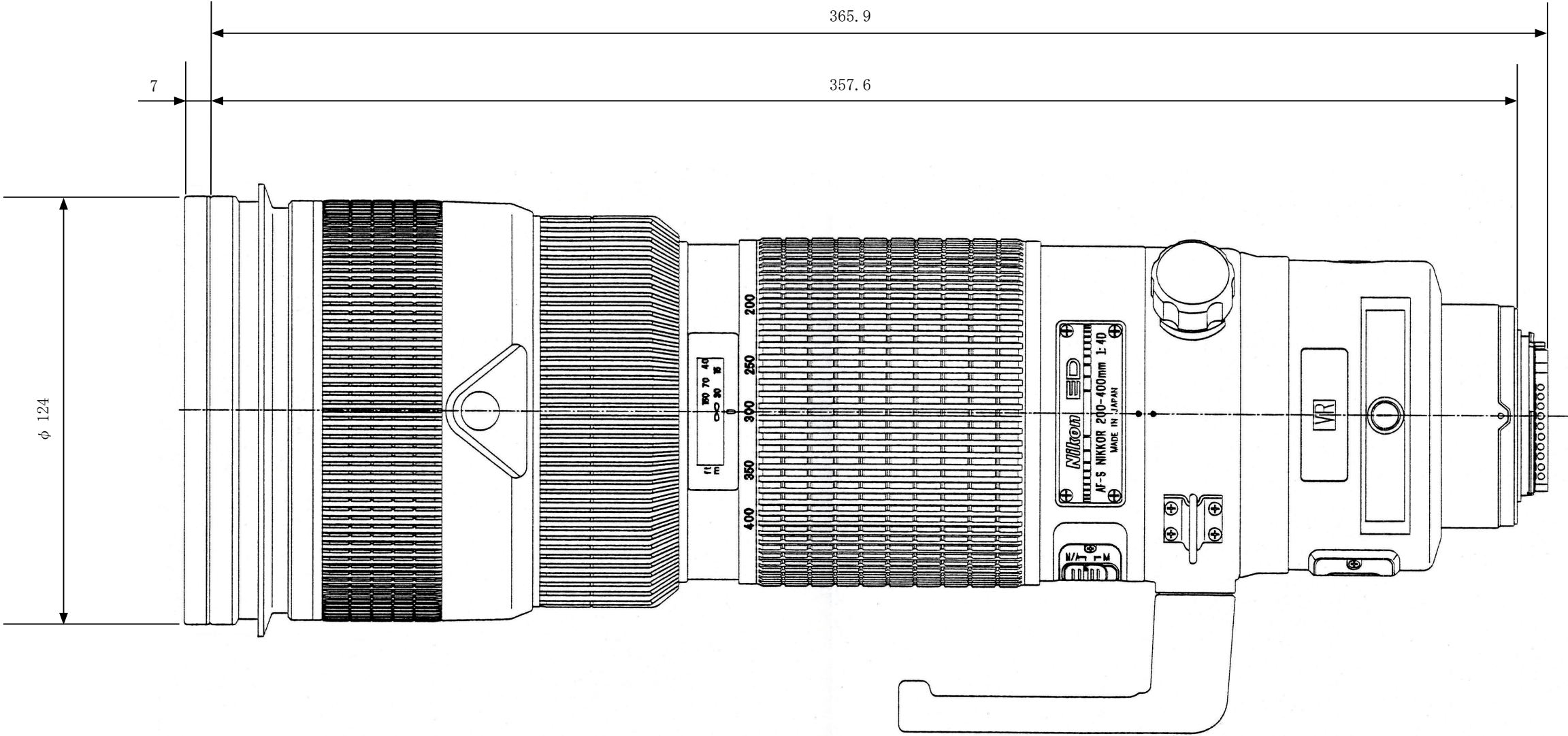


TOOLS

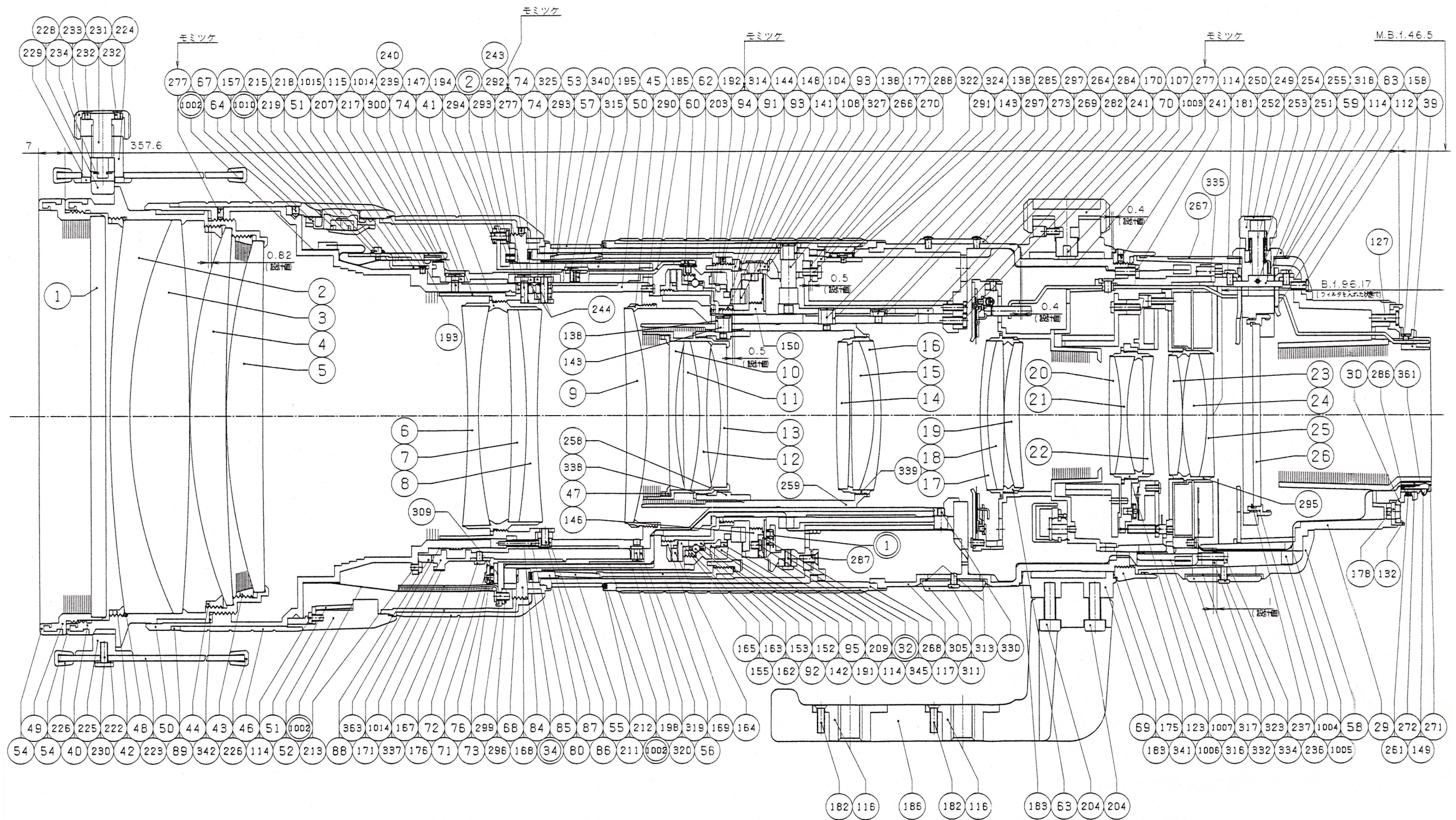
★ : New tool

RJNo	Name	Note
MZ-800S	DRY SURF MZ-800S	
GE-8	GREASE GE8	
EDB0011	SCREW LOCK 1401C	
L-241	LOCK END	
J19002	BACK FOCUS COLLIMATER LT-500S	
J18028	LENS ADAPTER FOR FOCUS TESTER 	
★ J18359	AF-S ZOOM 200-400 VR INSPECTION AND ADJUSTMENT SOFTWARE 	
J15306-1	AF-I COMMUNICATION BOX 	
J15307	AF-I COMMUNICATION ADPTER 	
J15355	SWITCHING TOOL 	
J15352	COMMUNICATION TOOL 	
	PERSONAL COMPUTER	
	POWER SUPPLY	
	OSCILLOSCOP	
J15380A	VR LENS ADJUSTMENT EQUIPMENT	AC 100V
J15380B	VR LENS ADJUSTMENT EQUIPMENT	AC 200V
★ J15380-5	VR LENS INSPECTION AND ADJUSTMENT SOFTWARE (Ver.4.0)	IBM 3.5 Inch
★ J11297	WERNCH FOR 2ND LENS GROUP	
★ J11298	WERNCH FOR 3RD LENS GROUP	
★ J11299	WERNCH FOR 4TH LENS GROUP	
★ J11300	WERNCH FOR 5TH LENS GROUP	
★ J11301	WERNCH FOR 6TH LENS GROUP	
★ J11302	WERNCH FOR 7TH LENS GROUP	

外觀図 Sketch drawings



組立図 Structure of the Lens



実体配線図

WIRING DIAGRAM

